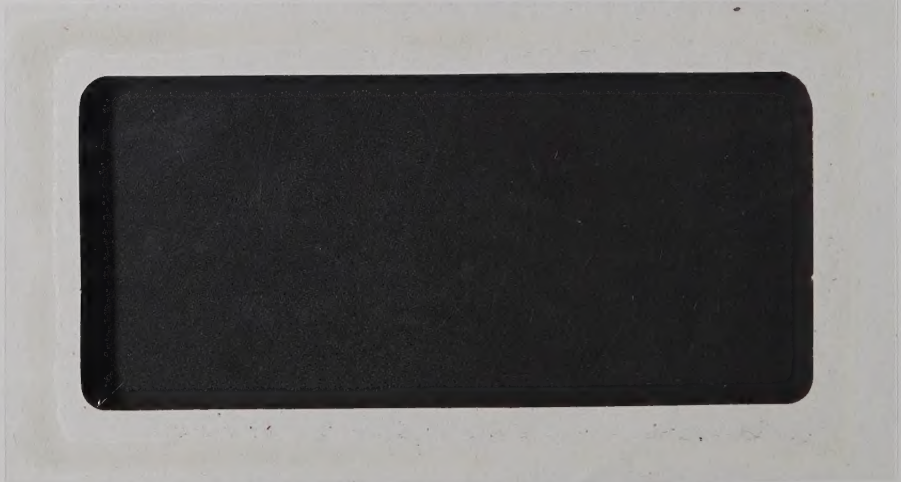
PHILIPS

PAL
Sub-carrier generator
PM 5555

(9449 055 55..1)

9499 490 04411

1/1068/1/04/05



MP MASTER
MA24522

PAL
Sub-carrier generator
PM 5555

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PHILIPS

operating and service manual

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Correspondence

In correspondence concerning this instrument, please quote the type number and serial number as given on the identification plate at the rear of the instrument.

1 Introduction

The PHILIPS PM 5555 is a solid-state PAL sub-carrier generator to be used in colour TV development and production as well as for studio applications, in combination with the PHILIPS PAL encoder PM 5554, a T.V. pulse generator (e.g. PHILIPS PM 5530) and a colour pattern generator (e.g. PHILIPS PM 5552). It supplies the PAL sub-carrier signal, burst-keying pulses and $12\frac{1}{2}$ Hz (or $\frac{1}{2}$ H) identification pulses.

To increase the number of applications, the PHILIPS PM 5558 a set of two print plates, enabling the PM 5555 to supply three test patterns (dots, crosshatch and combined) can be ordered separately. The signals comply fully with the parameters of the PAL-AB system, according to CCIR document XI/153*)

* If the system parameters will be modified, the specification of this instrument will be modified accordingly.

II Technical data

Properties expressed in numerical values with tolerances stated, are guaranteed by us. Numerical values without tolerances stated, represent the properties of an average instrument and merely serve as a guide.

A. Required input levels

Sync. and blanking pulses	2–8 V_{p-p}, negative
Max. tolerated superimposed hum	100%
Input impedance	high (looping through possible)

B. Sub-carrier

1. Internal oscillator frequency 4.433 618 75 MHz

Long term stability 5.10^{-7}/90 days

The generator has a facility for automatic sequential switching between two sub-carrier frequencies other than the nominal sub-carrier frequency (sub-carrier + and — 100 Hz). The time during which each oscillator operates is 10 seconds. Max. deviation between off-set frequencies and nominal sub-carrier frequency: 200 Hz.

2. External sub-carrier signal 1–10 V_{p-p}

Max. frequency deviation from nominal sub-carrier frequency	+ or —200 Hz
Input impedance	high (looping through possible).

3. Output voltage 4 V_{p-p}, ± 10% into 75Ω.

Output impedance 75 Ω.

* See section "MODIFICATIONS I".

C. Pilot

1. Frequency 2× line frequency; can internally be changed to 8× line frequency*.

2. Relationship line frequency sub-carrier frequency

$$f_H = \frac{f_{sc} - 25\ Hz}{284 - \frac{1}{4}} \text{ or}$$

$$f_{sc} = (284 - \tfrac{1}{4})\, f_H + 25\ Hz.$$

3. Output amplitude 4 V_{p-p}, ± 10% into 75 Ω.

D. Burst-keying pulses

1. Position Start nominally 5.6 ± 0.2 µs. after leading edge of line synchronizing pulse. Adjustable + and —0.5 µs. by means of screwdriver control at the front.

Fixed position for nominal value.

2. Width 2.25 ± 0.2 µs. (10 ± 1 cycles of sub-carrier).

3. Burst suppression 9 line times during field blanking period, in such a way that the burst is positive at the end as well as the start of each field (see Fig. XIX-1 and 2).

1st field	burst starts at line 7, burst stops after line 309.
2nd field	burst starts at line 319. burst stops after line 621.
3rd field	burst starts at line 6, burst stops after line 310.
4th field	burst starts at line 320, burst stops after line 622.

4. Output voltage 4 V_{p-p}, ± 10% (negative) into 75 Ω.
Output impedance 75 Ω

E. 12½ Hz pulses (can internally be modified to half the line frequency*.

1. These pulses appear every fourth field and coincide with the frame synchronizing pulse.
At delivery this coincidence is adjusted to occur in the first field.**

2. Output voltage 4 V_{p-p} (negative) into 75 Ω
Output impedance 75 Ω.

F. Mains supply

Voltage	115 or 230 V, ± 20%
Frequency	50 – 60 Hz
Power consumption	max. 45 W at 220 V.

G. Temperature range

Operating conditions —10% C to +50° C.

H. Mechanical construction

The instrument is built in a fully transistorized printed-wiring board construction. The instrument is delivered as a table model, but can be easily converted into a 19″ rack model.

Dimensions	height 3E = 150 mm incl. feet
	depth 420 mm incl. handles
	weight 12 kg.

* See section "MODIFICATIONS II"
** The coincidence can be re-adjusted to occur in another field, see section "MODIFICATIONS II"

III Accessories

With the instrument are delivered:
- 1 operating and service manual
- 8 BNC-connectors
- 5 BNC-75 Ω terminations
- 1 mains flex
- one extension board (in the instrument) enabling measurements on printed wiring boards during operating.

Can be ordered separately:

"Pattern kit" PM 5558

This kit contains 2 units, viz. unit 11 and unit 12, and their installing description. When inserting these printplates, and after having carried out the adjusting procedure, three test patterns (dots, crosshatch or combined) are available.

Technical Data PM 5558

a. Video signal

Two separate outputs

Output voltage	1 V_{p-p}, positive (incl. sync., no set-up* into 75 Ω.
Output impedance	75 Ω.

b. Crosshatch pattern

Number of vertical lines	19 (width: 200 ns.)
Number of horizontal lines	14 (width: 2 lines, one in each field).

c. Dot pattern

Dots are located in the centre of each square of the crosshatch pattern.

* set-up can be added
see section "MODIFICATIONS II"

IV Description of block diagram

(See Fig. IV-1 and Fig. IV-2)

Functionnaly, the generator can be divided into five parts:

A. Sub-carrier and pilot generator
B. Input amplifiers
C. Burst-key generator
D. 12½ Hz generator
E. Pattern generator (PM 5558).

A. SUB-CARRIER AND PILOT GENERATOR

(see Fig. IV-1)

By means of push-buttons (SK2, SK3, SK4), there are three ways to obtain a sub-carrier signal:

1. When depressing SK2 the "4.43 MHz oscillator" (U4) produces an internal sub-carrier with a frequency of 4.43361875 MHz.

2. When depressing SK3, an internal sub-carrier is produced by the "4.43 MHz ± Δf" oscillator. This frequency is during 10 seconds $f_{subc.}$ + 100 Hz, during the following 10 seconds $f_{subc.}$ — 100 Hz etc; this jumping is controlled by the 0.1 Hz jump oscillator (U3).

3. When depressing SK4 the externally applied sub-carrier is used.

Via a Schmitt trigger (U3) the sub-carrier is applied to two output amplifiers (U3) as well as to a 4.43 MHz low-pass filter (U8). To obtain the relationship between pilot frequency and sub-carrier frequency according to:

$$f_{line} = \frac{f_{pilot}}{2} = \frac{f_{subc.} - 25\ Hz}{284 - \frac{1}{4}}$$

first the 25 Hz is subtracted form the sub-carrier frequency.

This is obtained by means of a single side band modulation in a circuit consisting of two balanced modulators (U8) and some phase shifting networks (U9). In one modulator a +45° shifted sub-carrier signal is modulated with a 25 Hz signal while in the other modulator a —45° shifted sub-carrier signal is modulated with a —90° shifted 25 Hz signal. The sum of the modulator output signals will result in a signal with a frequency of ($f_{subc.}$ —25 Hz). Via a band-pass filter (U8) this signal is applied to an emitter-follower and from there to a dividing circuit to obtain the pilot frequency. The dividing system is built up as a 125 kHz crystal oscillator (U7) controlled by a phase discriminator (U6). The discriminator voltage depends on the phase difference between the sub-carrier frequency and the divided pilot frequency (32 : 1). The blocking oscillator (U6) gives the divided pilot frequency a suitable shape. By internal resoldering the pilot frequency can be changed from 2× line frequency to 8× line frequency. Via an output amplifier the pilot frequency is available at BU6 ("PILOT").

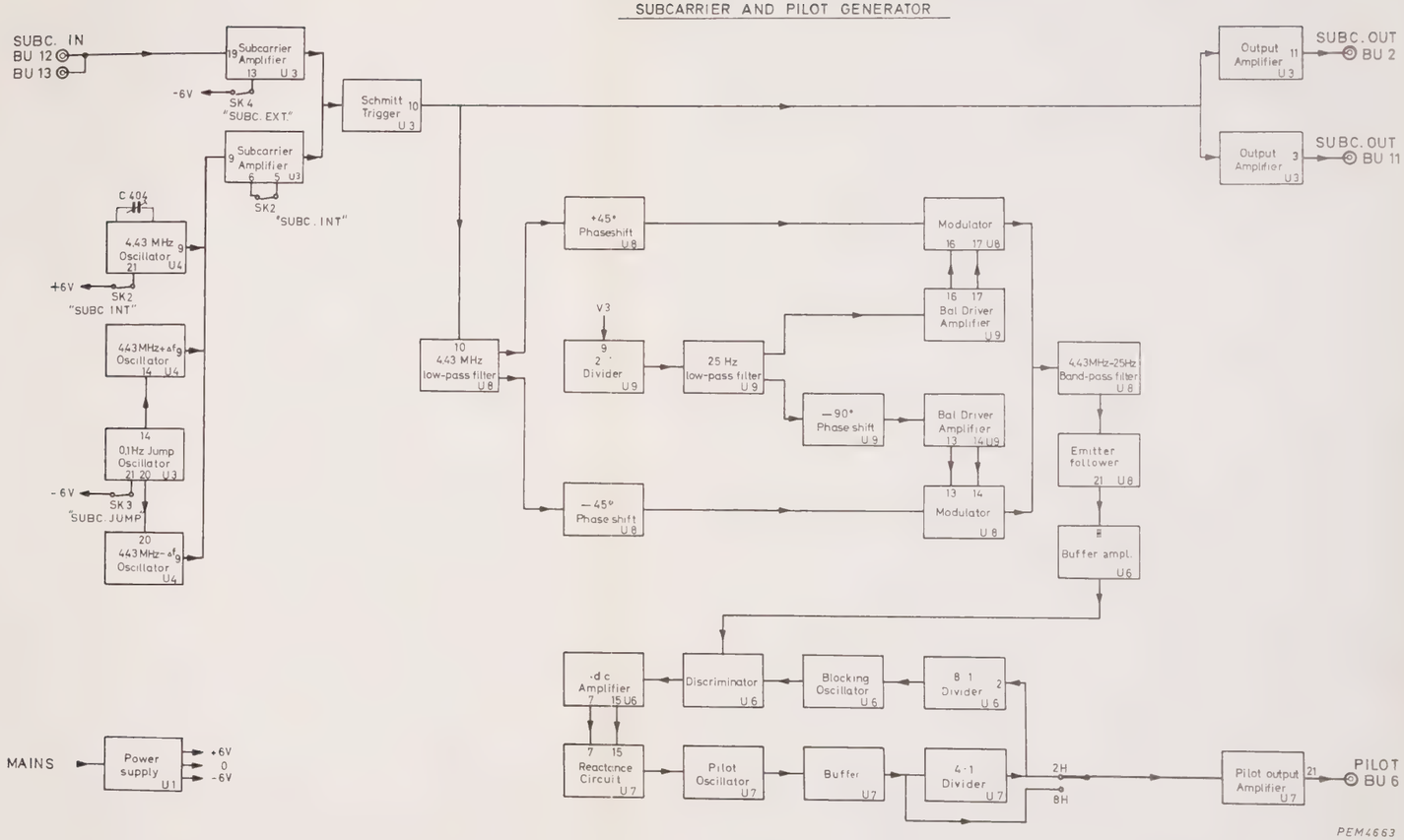


Fig. IV-1 Block diagram, sub-carrier and pilot generator

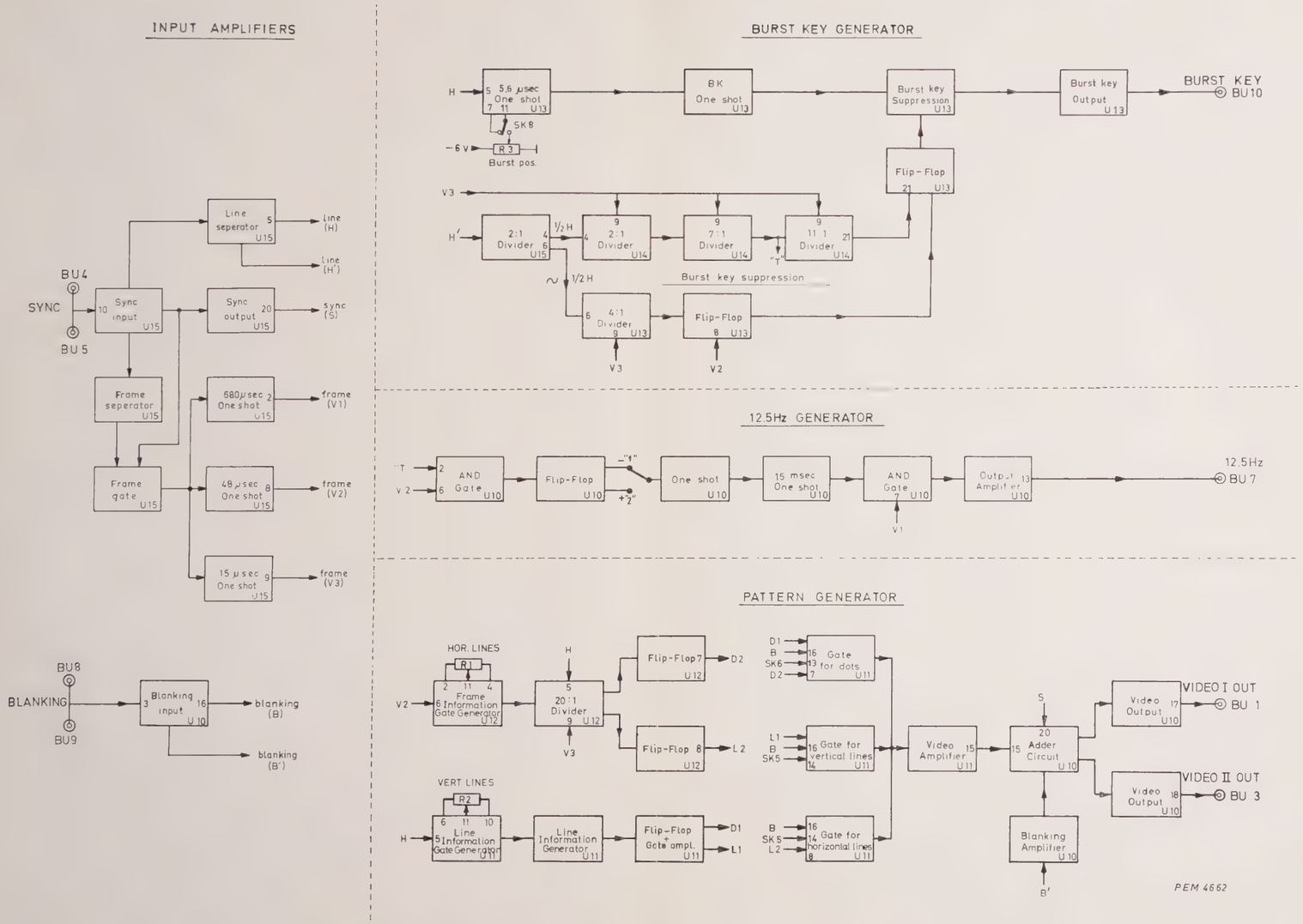


Fig. IV-2 Block diagram, burst-keying and pattern generator

B. INPUT AMPLIFIERS (see Fig. IV-2)

The input amplifiers (U10 and U15) amplify and shape the blanking and sync. signals from the TV pulse generator. The frame separator is followed by three one-shots (U15) supplying field pulses with a width of 15 µs, 48 µs, as well as pulses with a width of 680 µs.

C. BURST-KEY GENERATOR (see Fig. IV-2)

The burst-keying pulses are derived from the line synchronising pulses (H). A one-shot (U13) ensures the start of the pulse at 5.6 µs. after the leading edge of the line sync. pulse while the "BK" one-shot determines the width of the burst-keying pulse. The burst-key suppression circuit suppresses the burst-keying pulses during 9 lines of the field blanking period.

D. 12½ HZ GENERATOR (see Fig. IV-2)

The 12½ Hz pulses are derived from the by 2 divided field pulses (U10). The width is determined by a 15 ms. one-shot. To place the pulse in the correct field out of four possible fields, the trigger pulse to the one-shot can be delayed by means of internal resoldering in unit 10. On delivery the 12½ Hz pulse is placed in the first field (see Fig. XVI-2).

E. PATTERN GENERATOR (see Fig. IV-2)

Can be supplied optionally as PM 5558; units 11 and 12

The patterns (dots and crosshatch) are obtained by combining pulses from a frame information generator followed by a 20 : 1 divider (U12) and from a line information generator (U11).
The pulses are applied to AND-gates (U11), to where the blanking signal is applied as well.

In an adder circuit (U10) the synchronizing pulses are added, and via two output amplifiers (U10) the composite video signal is available on two separate sockets (BU1 and BU3).

The controls "HOR. LINES" and "VERT. LINES" are screwdriver controls at the front of the instrument. They can be used to centre the patterns on the screen of the connected measuring monitor.

V Installation

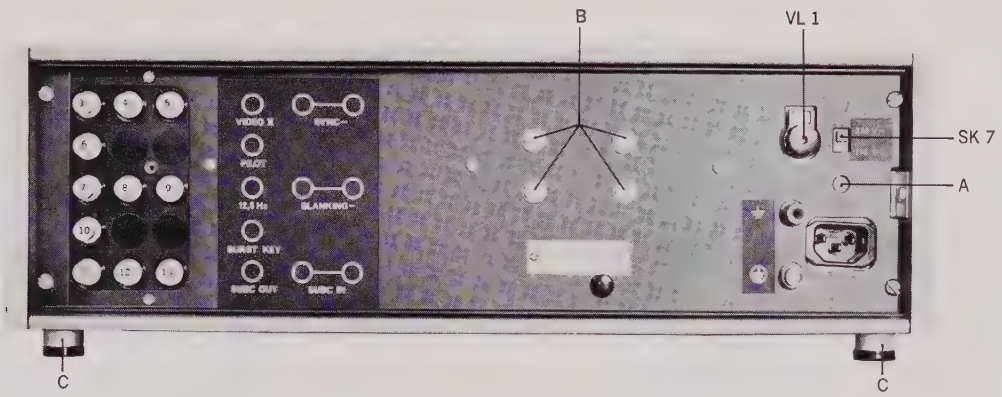


Fig. V-1 Rear view of the instrument

A. ADJUSTING TO THE LOCAL MAINS VOLTAGE

By means of voltage selector SK7 the instrument can be adjusted to mains voltages of 115 or 230 V, ± 20%. The selected value can be read near the switch. The instrument can be adjusted to the other mains voltage as follows:

- loosen screw "A" (Fig. V-l)
- set the switch to the desired range
- fasten screw "A" again
- replace fuse VL1:
  for 115 V – 400 mA (delayed-action type)
  for 230 V – 200 mA (delayed-action type).

B. EARTHING

Earth the instrument in accordance with the local safety regulations.

The metal cabinet can be earthed via:
- socket ⏚ (Fig. V-1).
- the earthing core of the mains flex.

The electrical circuit can be earthed via:
- socket ⏚ (Fig. V-1).
- the screening of the coaxial connection cables.

Avoid double earthing of the electrical circuit because this may introduce hum phenomena.

C. MOUNTING IN A 19″ RACK

- Remove the four screws ″B″ (Fig. V-1)
- Remove the four feet ″C″ (Fig. V-1) by turning them anti-clockwise
- Screw the feet in the threaded holes (of screws ″B″) in the rear panel
- Remove the screws ″D″ (Fig. V-2) and pull the brackets ″E″ out
- Insert the brackets ″E″ as shown in Fig. V-3
- The instrument can now be mounted in a 19″ rack with screws inserted through holes ″F″ in the brackets ″E″.

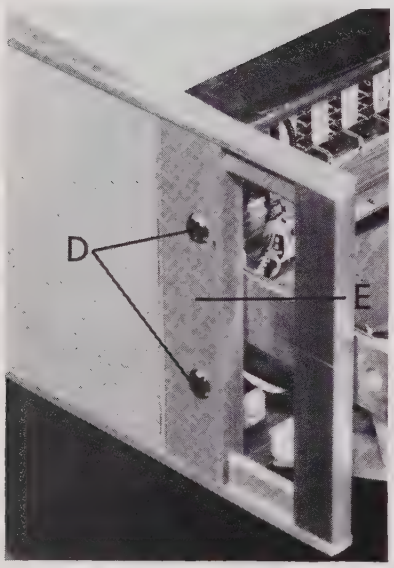


Fig. V-2 Side view

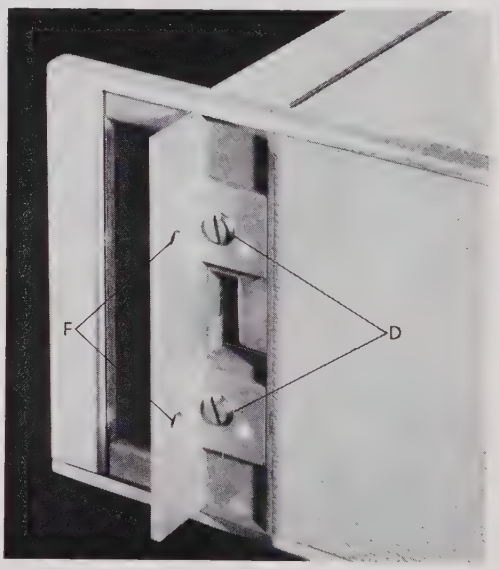


Fig. V-3 Side view

D. Connections

Apply the following signals to your PM 5555 (see Fig. V-4):

1. From a TV-Pulse Generator (e.g. PHILIPS PM 5530)

(via the looped-through input sockets of the connected encoder PM 5554)
- negative mixed sync. signal S (socket ″SYNC–″)
- negative mixed blanking signal B (socket ″BLANKING–″).

The parallel sockets should be terminated with 75 Ω, when not used for looping-through purposes.

2. To the TV-Pulse Generator (e.g. PHILIPS PM 5530)

- 2H (31.25 kHz) or 8H (125 kHz) pilot signal (socket ″PILOT″)

Depending on the position of the switching link in the PM 5530 and that in the PM 5555, the frequency of the pilot signal will be 2H or 8H. The recently supplied instruments have all been pre-set by the factory to 2H. If your PM 5530 and/or PM 5555 is set for an 8H-pilot, it is advisable to modify your PM 5530 for a 2H-signal and/or to modify your PM 5555 to supply a 2H-signal according to the instructions in section ″MODIFICATIONS I″, Points A2 and B.

However, if your PM 5530 is of the –/01 version it is only suitable for an 8H-pilot signal. In that case we recommend you to modify your PM 5555 to supply an 8H-pilot signal. The procedure described in section ″MODIFICATIONS I″, point A1, should be followed only in those cases where it is absolutely necessary for the PM 5530/01 to accept a 2H-pilot signal.

3. To the encoder PM 5554

- negative burst-keying pulses (socket ″BURST KEY″)
- subcarrier signal (socket ″SUBC. OUT″).

The parallel sockets should be terminated with 75 Ω, when not used for looping-through purposes.

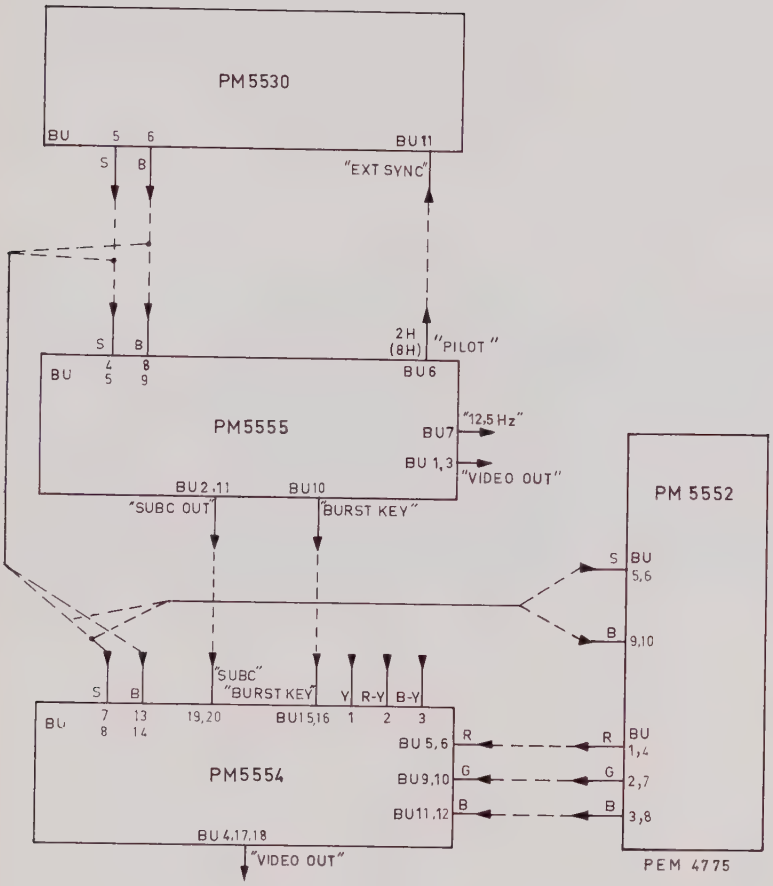


Fig. V-4 Connections

VI Survey of controls and sockets

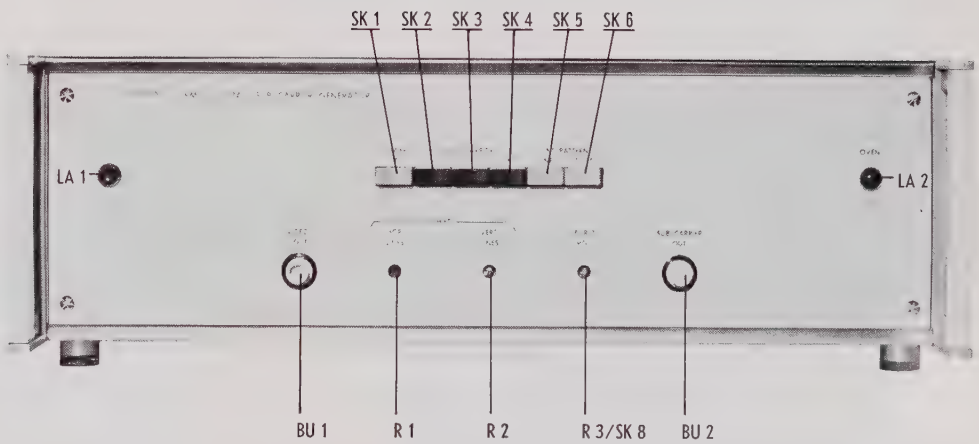


Fig. VI-1 Front view of the instrument

A. Front of the instrument (see Fig. VI-1)

LA1
pilot lamp; lights up when the instrument is switched on.

LA2 "OVEN"
pilot lamp; lights up as soon as the thermostat in the sub-carrier crystal oven switches on the heating element.

SK1 "POWER ON"
mains switch; the instrument is switched on by depressing and switched off by re-depressing.

SK2 "INT."
by depressing, the internal sub-carrier of 4.433 618 75 MHz is available on BU2 and BU11.

SK3 "JUMP"
by depressing, an internal sub-carrier signal with a frequency that changes every ten seconds from $f_{subc.}$ + 100 Hz to $f_{subc.}$ — 100 Hz and back, is available on BU2 and BU11.

SK4 "EXT."
by depressing, an external sub-carrier signal with a frequency deviating maximum 200 Hz of the internal sub-carrier can be applied to BU12 or BU13. This sub-carrier is available on BU2 and BU11.

SK5 "LINES"
by depressing, a crosshatch pattern is generated if unit 11 and unit 12 (PM 5558) are present in the instrument. This video signal is available at BU1 and BU3. Depressing SK5 and SK6 simultaneously results in a combined pattern of dots and crossed lines.

SK6 "DOTS"
by depressing a dot pattern is generated if unit 11 and unit 12 (PM 5558) are present in the instrument. This video signal is available at BU1 and BU3. Depressing SK5 and SK6 simultaneously results in a combined pattern of dots and crossed lines.

R2 "VERT. LINES"
screwdriver control for horizontal shift of the patterns "LINES" and "DOTS", if unit 11 and unit 12 (PM 5558) are present in the instrument, and SK5 and/or SK6 are depressed.

R3/SK8 "BURST POS."
screwdriver control shifting the location of the burst-keying pulses.* When turning fully counter clockwise (SK8 switched) the burst has its standard position.

* And as a result of which the burst in the video output signal of the connected encoder PM 5554 shifts as well.

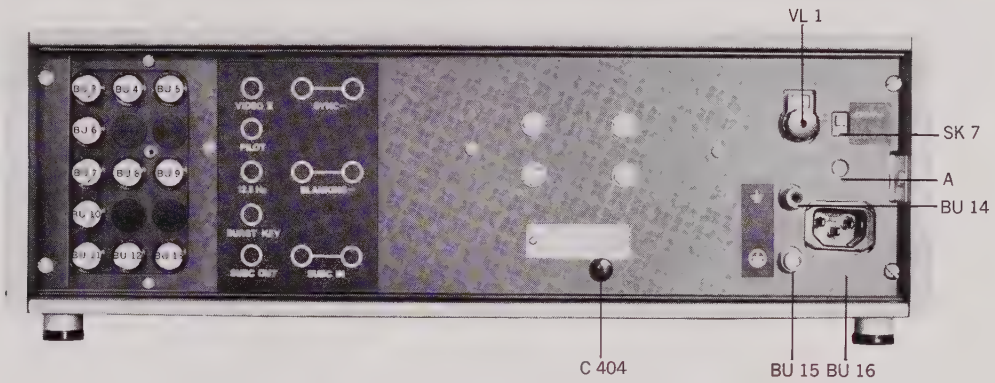


Fig. VI-2 Rear view of the instrument

BU1 "VIDEO I OUT"
output socket for the internal video signal (Ro = 75 Ω), if unit 11 and unit 12 (PM 5558) are present in the instrument, and SK5 and/or SK6 are depressed.

BU2 "SUB-CARRIER OUT"
output socket for the sub-carrier signal (Ro = 75 Ω).

R1 "HOR. LINES"
screwdriver control for vertical shift of the patterns "LINES" and "DOTS", if unit 11 and unit 12 (PM 5558) are present in the instrument, and SK5 and/or SK6 are depressed.

B. Rear of the instrument (see Fig. VI-2)

BU3 "VIDEO II"
output socket for the video signal (Ro = 75 Ω), if unit 11 and unit 12 (PM 5558) are present in the instrument, and SK5 and/or SK6 are depressed.

BU4 "SYNC-"
input socket for the complete synchronizing signal (negative polarity). Interconnected with BU5.

BU5 "SYNC-"
interconnected with BU4.

BU6 "PILOT"
output socket for the pilot signal.

BU7 "12.5 Hz"
output socket for the 12.5 Hz pulses* (Ro = 75 Ω).

BU8 "BLANKING-"
input socket for the complete blanking signal (negative polarity). Interconnected with BU9.

BU9 "BLANKING-"
interconnected with BU8

BU10 "BURST KEY"
output socket for the burst-keying pulses (Ro = 75 Ω).

BU11 "SUBC OUT"
output socket for the sub-carrier signal (Ro = 75 Ω).

BU12 "SUBC IN"
input socket for an external sub-carrier signal. Interconnected with BU13.

BU13 "SUBC IN"
interconnected with BU12.

BU14 "⏚"
socket for earthing the electrical circuit.

BU15 "⏚"
socket for earthing the cabinet.

BU16
mains socket.

C404 "OSC. FREQ."
screwdriver control for frequency fine adjustment of the internal subcarrier signal. Range: + and —10 Hz.

SK7 "230 V — 115 V"
mains voltage selector. The position of this switch can be changed if screw "A" is loosened a few turns.

VL1
safety fuse: 230 V – 200 mA, delayed action type.
115 V – 400 mA, delayed action type.

Note: The input impedances of the input sockets "SYNC.-", "BLANKING-" and "SUBC IN" are high. These signals can therefore be looped through.
If the parallel sockets are not used for looping through purposes, they should be terminated with 75 Ω.

* These pulses can be modified to half the line frequency; the location of these pulses can be modified as well, see section "MODIFICATIONS II".

VII Modifications I

This section deals with modifications which may be necessary for instruments of different production series to ensure that the mutual requirements are met.

A. TV-Pulse Generator PM 5530

1. PM 5530/01

The —/01 version of the PM 5530 can only accept an 8H-pilot signal (125 kHz).
However, it can be made suited for a 2H-pilot signal (31.25 kHz) by modifying its circuits.
On unit G: "MASTEROSCILLATOR":
- Interrupt connection between 10CB3 and 7CB2.
- Interrupt connection between 1CB5 and 2/3 CB4.
- Connect 1CB5 to 7CB2.
- On the socket of unit G, interrupt the connection wire to terminal 18.
- Connect terminal 10 of unit U (terminal board) to terminal 18 of unit G, via a capacitor of 0.1 μF.

Note:
By this modification, switches "X-TAL", "MAINSLOCK" and "JUMP" of your PM 5530/01 are rendered inoperative.

2. PM 5530/02, —/03, etc.

The PM 5530 can be made to accept a 2H- or an 8H-pilot signal by simple changing the position of the switching link on unit G*, "MASTEROSCILLATOR".
Upon delivery, the instrument is preset for a 2H-pilot signal.
- If terminal 16 on the printed wiring board is connected to 1CB5, the instrument is set for a 2H-pilot signal.
- If terminal 16 on the printed wiring board is connected to 10CB3, the instrument is set for a 8H-pilot signal.

* In the PM 5530/04, –/05, etc. this unit is called – unit 7 –

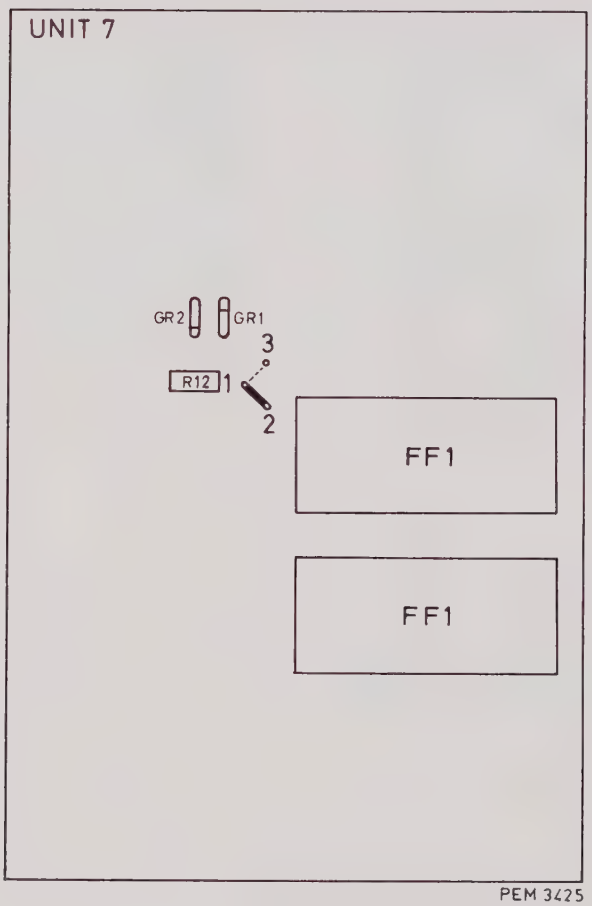


Fig. VII-1 Modification, unit 7

B. Subcarrier Generator PM 5555

The PM 5555 can be made to supply a 2H- or an 8H-pilot signal by simply changing the position of the switching link in unit 7 "PILOT OSCILLATOR".

- If R12 is connected to 1CB2 (connection 1-2 in Fig. VII-1), the instrument supplies a 2H-pilot signal.
- If R12 is connected to the base of TS4 (connection 1-3 in Fig. VII-1), the instrument supplies a 8H-pilot signal.

VIII Modification II

This section deals with modifications which may be carried out to your PM5555 for a slight change of performance.

A. Introduction of set-up in the video output signal

Your PM 5555 produces if it comprises units 11 and 12 which together form the PM 5558, no set-up in the video-output signal.
However, set-up can be introduced by:
– introducing a resistor (R11) e.g. approx. 20 kΩ (for 5% set-up) in unit 10 between the collector of TS4/R10 and R20/R13, etc.

Unit 10 should than be re-adjusted.
Proceed as follows:

Check the video output signal on socket "VIDEO OUT I" or "VIDEO OUT II" (terminated with 75).

– the picture-information should constitute 67% of the total signal amplitude. If not, select another value for R14.
– the sync. amplitude should be 28% of the total signal amplitude. If not select another value for R16.
– the set-up should be the required percentage of the total signal amplitude. If not, connect resistor R12, having a value between 180 kΩ and 390 kΩ in parallel to the added R11.

Check that the total signal amplitude on sockets "VIDEO OUT I" and "II" is 1 V_{p-p}. If not, select another value for R19 (12 kΩ...27 kΩ). It may be necessary to increase the value of R11, R13, R15 and/or R18 to obtain the required amplitudes.

B. Incorporating the Pattern Kit PM 5558

If your PM 5555 is not provided with units 11 and 12 which together constitute the pattern kit PM 5558, these units can still be incorporated easily. A simple check and if necessary a slight re-adjustment should then be made to ensure its proper operation (see the checking instructions for unit 11: "Oscillator frequency for horizontal pattern information").
It is also advisable then to check the picture/sync. ratio, and the total amplitude. If necessary, also check whether or not set-up is present in the video output signal (see the checking instructions for unit 10: "Adder circuit").

Note:
The patterns can be shifted in the vertical and the horizontal direction by means of the screwdriver controls "SHIFT-HOR. LINES" and "SHIFT-VERT. LINES" on the front panel.

C. Removal of the Pattern Kit PM 5558

If your PM 5555 is provided with the unit 11 and 12 (which together constitute pattern kit PM 5558), these units can simply be removed, without any modifications or re-adjustments.

D. Placing the 12½ Hz pulse in the desired field

Upon delivery the 12½ Hz pulse is placed in the first field. The pulse can be placed in the 1st, 2nd, 3rd or 4th field by resoldering some connections in unit 10 (see Fig. VIII-1):
1st field: connect 1 to 3 and b to d,
2nd field: connect 1 to 3 and c to d,
3rd field: connect 2 to 3 and a to d,
4th field: connect 1 to 3 and a to d.

E. ½ H-pulses instead of 12½ Hz-pulses

The ½H-pulses (having half the line frequency) can be obtained on socket BU7 by modifying unit 10 and unit 15.
Unit 10: (see Fig. VIII-1).
Unit 15: remove resistor R60 and transistor TS23 and insert a resistor of 5600 Ω, ¼ W between terminals 2 and 4 (see Fig. VIII-2).
Connect a 100 pF capacitor in parallel with the 5600 Ω resistor to be included.
If this resistor and the capacitor are connected

between terminals 2 and 4, the resulting $\frac{1}{2}$ H-signal is positive during TV-lines with "positive" burst-phase (135°) and negative during other lines.
To obtain a $\frac{1}{2}$ H-signal in phase opposition the parallel circuit 5600 Ω//100 pF should be included between terminals 2 and 6 instead of of 2 and 4.

Note:
The time delay between the start of the line sync pulse that is being applied and the start of the generated $\frac{1}{2}$ H-signal should be approx. 1 µs.

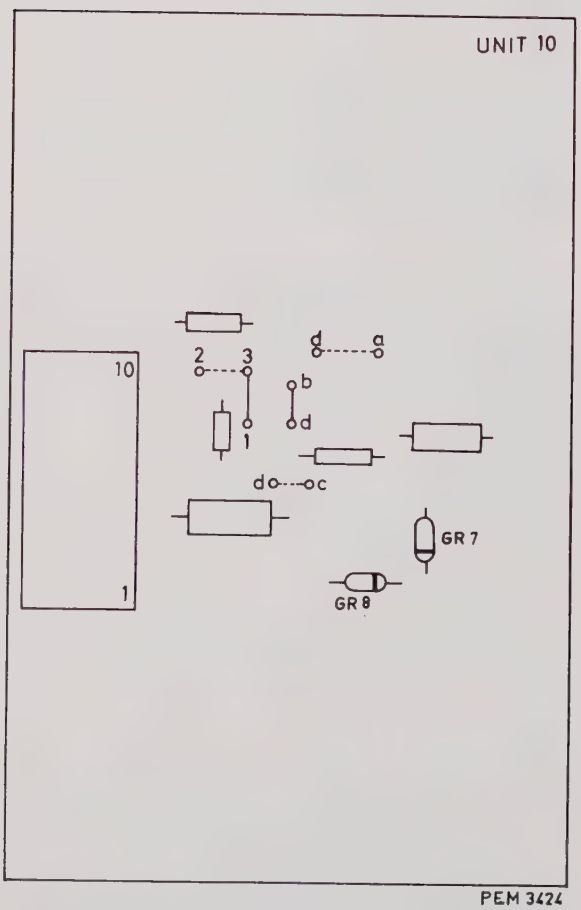


Fig. VIII-1 Modification, unit 10

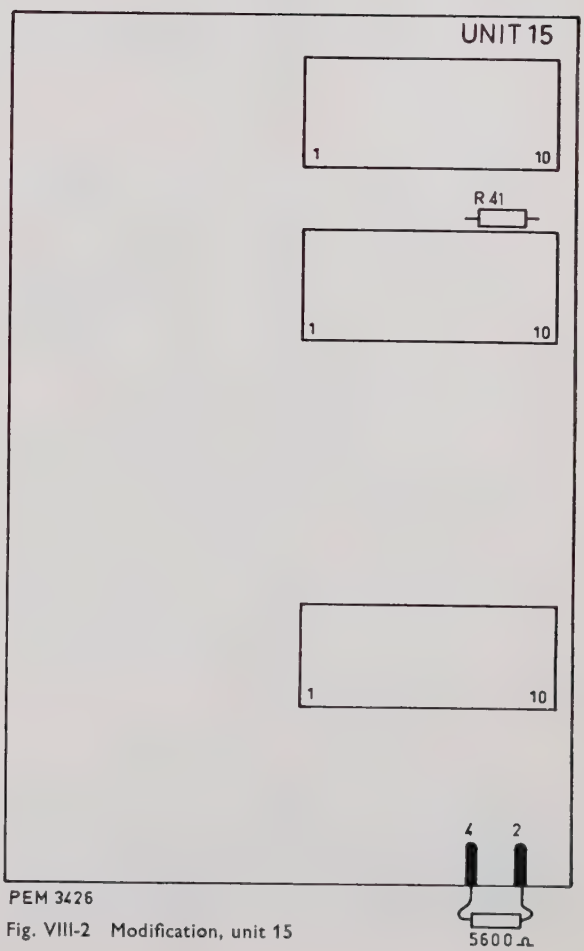


Fig. VIII-2 Modification, unit 15

SERVICE INSTRUCTIONS

In the following chapters the circuitry of the units has been explained. The service adjustments have been described at the end of the chapter concerned.
Please bear in mind the following notes:

- The unit to be checked or adjusted, should be placed on the "EXTENSION BOARD", unit 2 of the instrument.
- Load outputs with 75 Ω.
- Load parallel input sockets with 75 Ω.
- Connect a TV-pulse generator
  PHILIPS PM 5530 and an encoder
  PHILIPS PM 5554 according to chapter V, section D.
- The tolerances mentioned are factory tolerances which apply when readjusting the instrument. They may differ from those shown in section "GENERAL INFORMATION" chapter "TECHNICAL DATA".
- The voltages shown in the diagram and the oscillograms published have been measured with respect to terminal 12 on all units in a PM 5555 connected to 220 V~.
- The d.c. voltages have been measured with a PHILIPS d.c. voltmeter PM 2430.
- The a.c. voltages on unit 1 have been measured with a PHILIPS a.c. voltmeter PM 2451.
- The oscillograms have been measured with a PHILIPS oscilloscope PM 3330 in combination with a PHILIPS double beam plug-in unit PM 3342 and a PHILIPS timebase delay unit PM 3347.
- The oscillograms have been photographed with a PHILIPS camera outfit PM 9300.
- The diagrams are provided with figures for reference; [40], in the diagram for example, refers to oscillogram no. 40.

N.B Never forget to switch off the mains when exchanging printed wiring units!

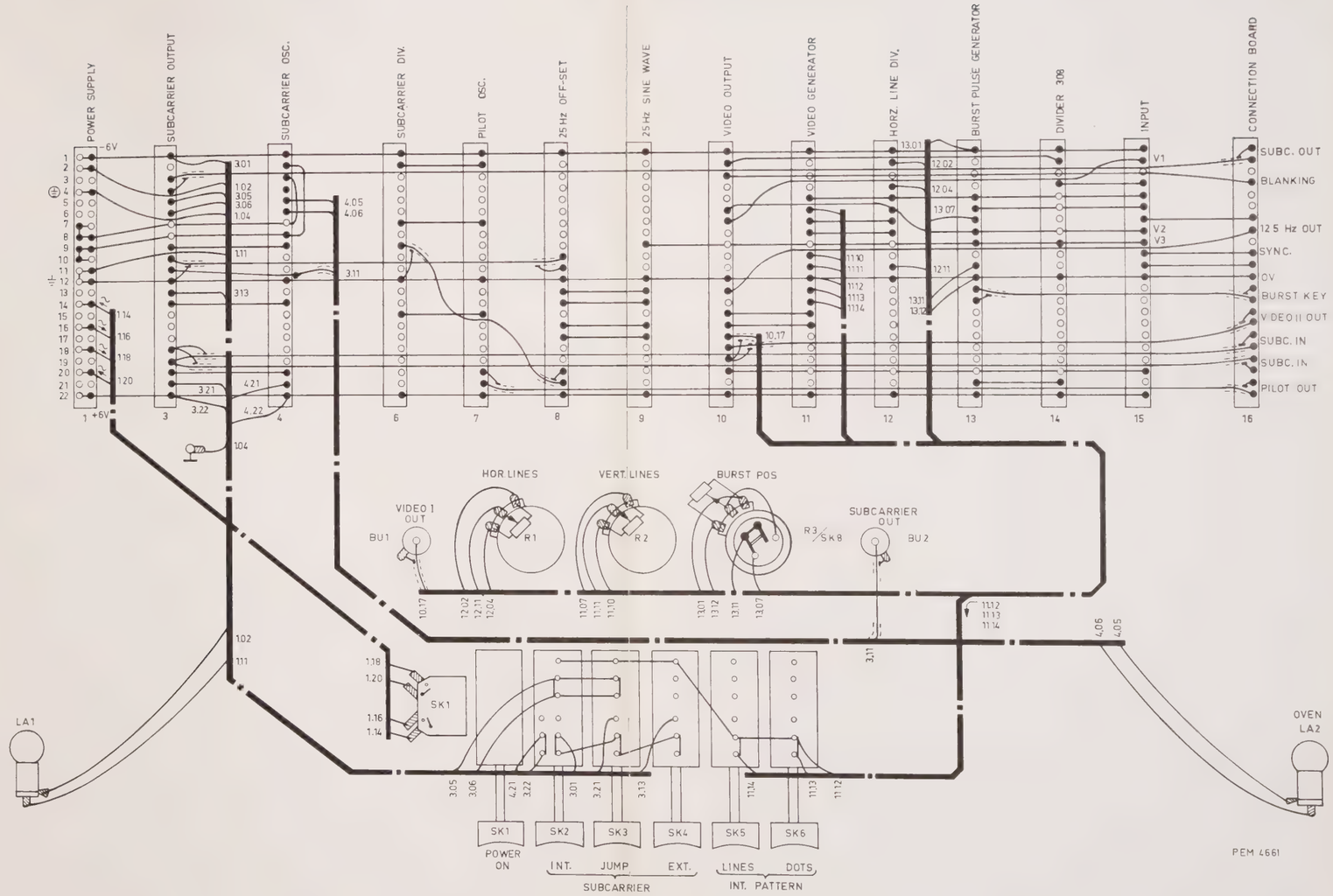


Fig. IX-1 Wiring diagram

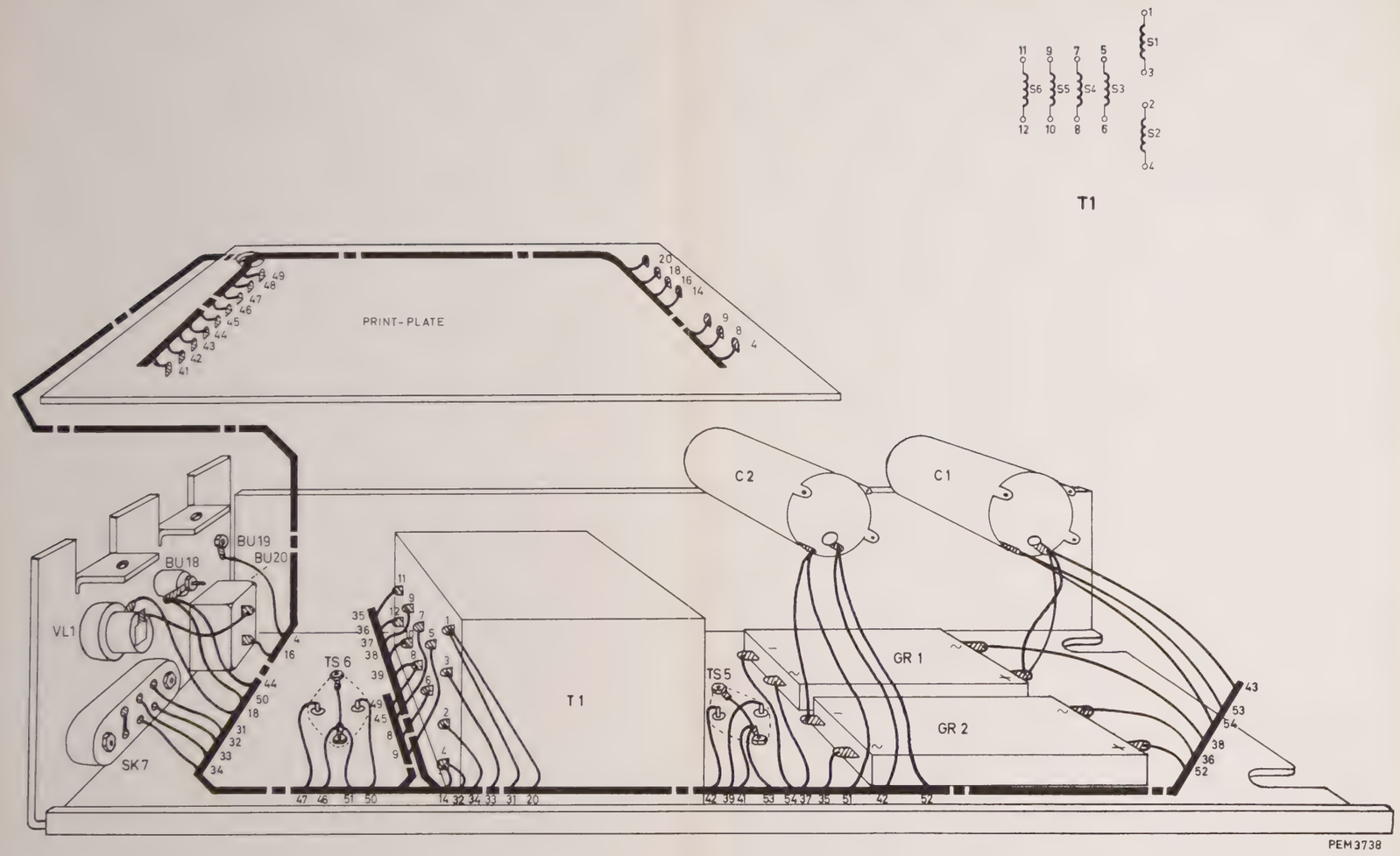


Fig. IX-2 Wiring, power supply, unit 1

IX Unit 1

Power supply

The power supply unit contains two stabilized rectifiers for the voltages —6 V and +6 V.
Stabilizing is effected by controlling the current through series transistors TS5 and TS6 so that the voltages are kept constant.
The control voltages to these transistors are obtained by comparing the —6 V and +6 V with the voltages stabilised across Zener diodes GR5 and GR6.
The control voltages thus obtained are amplified in TS3 and TS4 respectively, and applied to TS5 and TS6.
TS1 and TS2 protect the power supply against overloading.
The bias of these transistors is so chosen that they are cut off at normal load.
However, if the power supply is overloaded, the voltage across R4 or R8 (depending on which one is overloaded) will increase to such a value that the relevant transistor starts conducting, which causes the current through the control transistor to decrease.

Checking and adjusting

Measuring equipment:
D.C. voltmeter: e.g. PHILIPS PM 2430
Oscilloscope: e.g. PHILIPS PM 3230

The —6 V

Connect the voltmeter between connections 1 and 12 (12 is common).
The voltage should be —6 V ± 60 mV.
Select another value for R15 (between 82 Ω and 1.5 kΩ) if the voltage deviates more than 60 mV.

The +6 V

Connect the voltmeter between connections 22 and 12 (12 is common). The voltage should be +6 V ± 60 mV.
Select another value for R21 (between 82 Ω and 1.5 kΩ) if the voltage deviates more than 60 mV.

The ripple voltage

With PM 5555 connected to a mains of 185 V (SK7 at "230 V") the ripple measured with the oscilloscope at connections 1 and 22 with respect to connection 12 should not exceed 1 mV_{p-p}.

Overload transistor TS1

Disconnect connection 1 (—6 V) of the contact block.
Connect a resistor of 8 Ω between connections 1 and 12.
Connect voltmeter between base and emitter of TS1 (⏚ at base, — at emitter).
The voltage should be between 100 mV and 200 mV.
Select another value for R2 (between 100 Ω and 2.2 kΩ) if the voltage is outside these limits.

Overload transistor TS2

Disconnect connection 22 (+6 V) from the contact block.
Connect a resistor of 10 Ω between connection 22 and 12.
Connect voltmeter between base and emitter of TS2 (⏚ at base, —at emitter).
The voltage should be between 100 mV and 200 mV.
Select another value for R6 (between 100 Ω and 2.2 kΩ) if the voltage is outside these limits.

The voltage stability

In case of a mains voltage variation of 185 V to 275 V (SK7 at "230 V"), the stabilized voltages (—6 V and +6 V) should not vary more than 0.5% (= 30 mV).

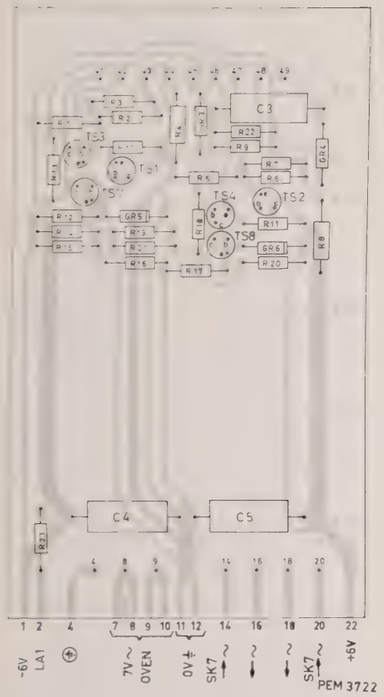


Fig. IX-3 Printed wiring board, power supply, unit 1

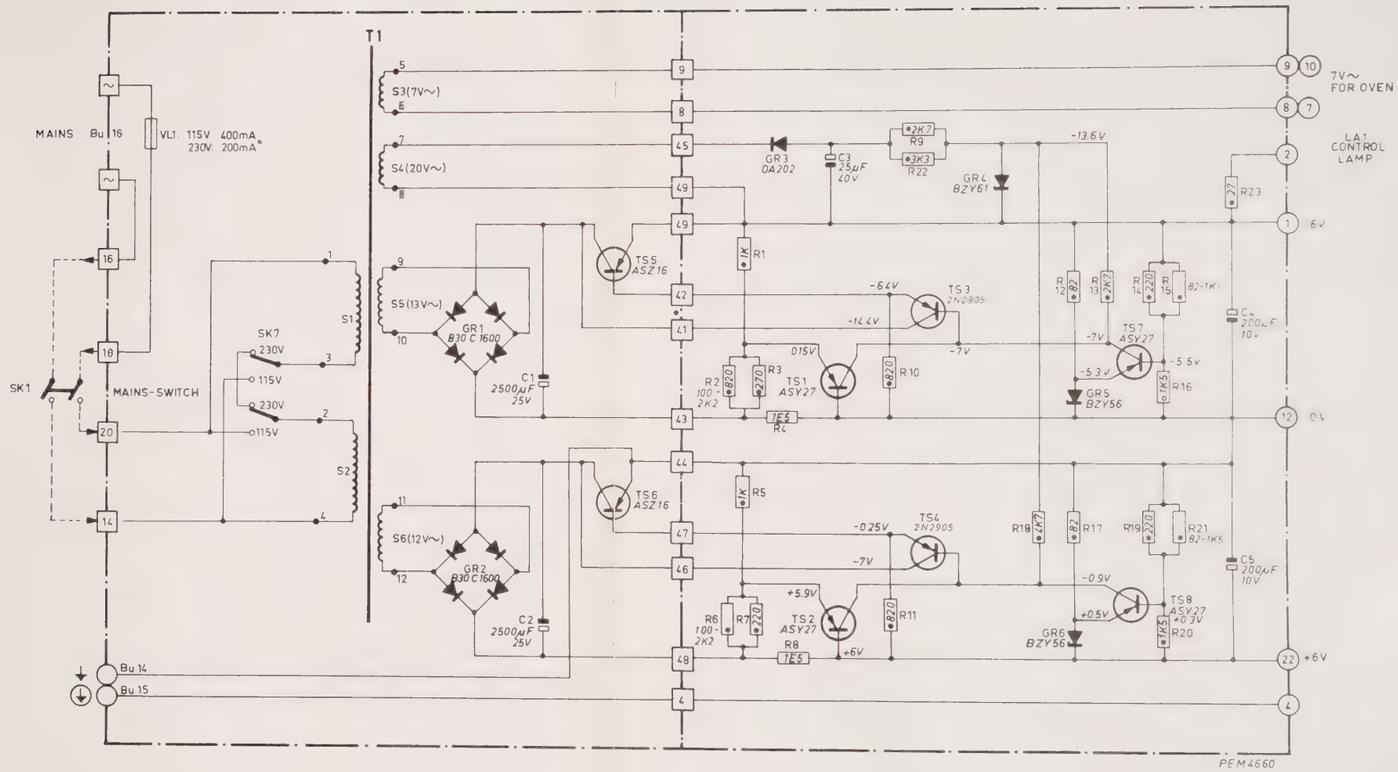


Fig. IX-4 Circuit diagram, power supply, unit 1

X Unit 3

Sub-carrier output

This unit consists of:
1. Two separate output amplifiers for "SUB-CARRIER" ("EXT." or "INT.")
2. The jump timing circuit for "SUB-CARRIER JUMP".

Output amplifiers

These amplifiers have two input stages, TS1...TS3 and TS6-TS7. By means of SK2/SK3 and SK4 a selection can be made between internal sub-carrier and external sub-carrier signal (SK2/SK3 is mechanically coupled with SK4).
If SK2 "SUB-CARRIER INT." or SK3 "JUMP SUB-CARRIER" is depressed, the base level (—6 V) of TS6 is switched off. This transistor, which has been cut off, is then opened. The INTERNAL SUB-CARRIER is then from terminal 9 applied to "Schmitt-Trigger" TS4-TS5 via emitter follower TS6 and amplifier TS7.
The base of TS1 is then via R3 connected to common. This transistor is saturated so that the base of TS2 is supplied with a negative voltage (approx. —6 V), TS2, therefore, is cut off and blocks the amplifier for the EXTERNAL SUB CARRIER applied to terminal 19.
If SK4 "SUB CARRIER EXT" is depressed SK2 "SUB CARRIER INT." is released and TS6 is supplied with a negative base voltage (—6 V, via SK2) and blocks the amplifier for INTERNAL SUB CARRIER.
The EXTERNAL SUB CARRIER signal is now applied to TS4-TS5 from terminal 19, via emitter follower TS2 and amplifier TS3, because TS1 is then cut-off.
In spite of that the input signal "EXTERNAL SUB CARRIER" or "INTERNAL SUB CARRIER" can be between 0.5 V and 10 V_{p-p}, the output signal of the Schmitt trigger is constant approx. 5 V_{p-p}. This ensures a constant signal amplitude on terminal 10 (used for the "25 Hz off set modulator" in unit 8) and the two output stages.
TS8...TS11 and TS12...TS15 are two identical push-pull output amplifiers. The sub-carrier is applied to TS8 and TS10. TS8-TS10 are operating as drivers for TS9 and TS11 respectively.

The positive half-period of the sub-carrier is amplified by TS8-TS9 and the negative half-period by TS10-TS11. To ensure a perfect sinewave and for adjusting the phase relation of the two outputs, the amplified sub-carrier signal is passed through the series resonant circuit L1/C13-C14.
Output amplifier TS12-TS15 is identical to TS10-TS11. The subcarrier from terminal 11 is applied to BU2 "SUB-CARRIER OUT" (front of the instrument). The sub-carrier from terminal 3 is applied to BU11 "SUBC OUT" (rear of the instrument).

Jump oscillator

By means of SK3 "SUB-CARRIER JUMP", an internal sub-carrier is produced by the "4.43 MHz $\pm$ Δf" oscillators in unit 4.
This frequency is f subc + 100 Hz during 10 seconds and f subc —100 Hz during the following 10 seconds, etc. If SK3 is depressed CB1 (FF1) and oscillator TS16-TS17 are activated by the —6 V supply.
The oscillator is connected as a multivibrator, while its frequency (0.1 Hz) is determined by R39/C26 and R40/C27.

This frequency, a square wave signal, controls CB1, which operates as a 2 : 1 divider. This divider produces a symmetrical block-shaped voltage having a period duration of 20 s, which is applied to terminals 14 and 20.
This block-shaped voltage is used to start and stop the sub-carrier jump oscillators in unit 4. During 10 s the level at terminal 14 is negative and terminal 20 is 0 v, the following 10 s the level at terminal 20 is negative and terminal 14 is 0 V, etc.

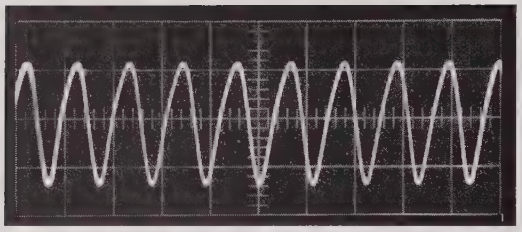
Checking and adjusting

Measuring equipment:
Oscilloscope : e.g. PHILIPS PM 3330
with dual trace Y-amplifier : e.g. PHILIPS PM 3342

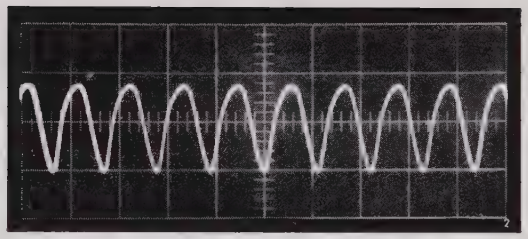
Sub-carrier wave form and phase

Depress SK2 "SUB CARRIER INT."
Connect A-amplifier of oscilloscope to BU2 "SUB CARRIER OUT" and load with 75 Ω.
Connect B-amplifier of oscilloscope to BU11 "SUBC OUT" and load with 75 Ω.

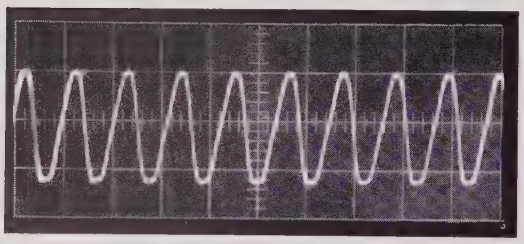
Both sub-carrier signals should be sinewave shaped and the amplitude should be 4 V_{p-p} + or —400 mV.
The sinewaves should have the same phase.
If not, readjust by means of C13 and C22.



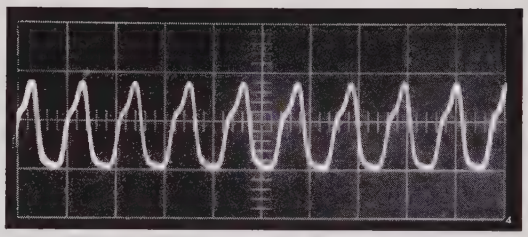
1. 0.5 V/cm 0.2 μs/cm



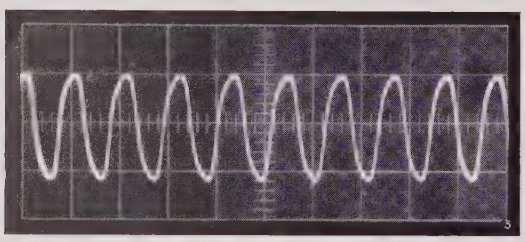
2. 1 V/cm 0.2 μs/cm



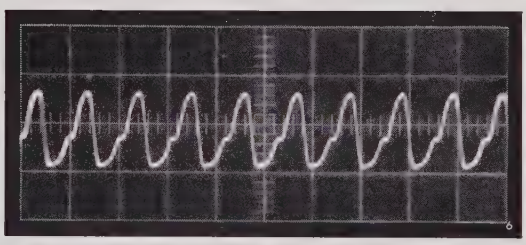
3. 2 V/cm 0.2 μs/cm



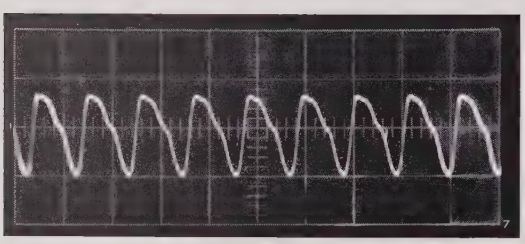
4. 2 V/cm 0.2 μs/cm



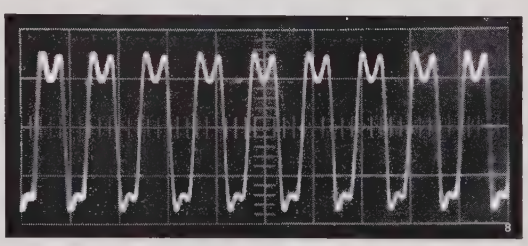
5. 2 V/cm 0.2 μs/cm



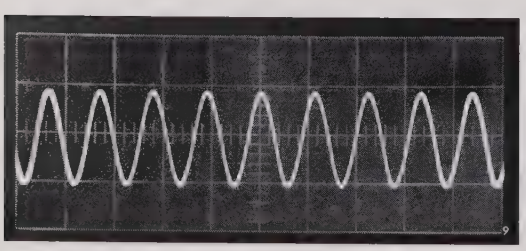
6. 1 V/cm 0.2 μs/cm



7. 1 V/cm 0.2 μs/cm



8. 3 V/cm 0.2 μs/cm



9. 4 V/cm 0.2 μs/cm

Fig. X-1 Oscillograms, unit 3

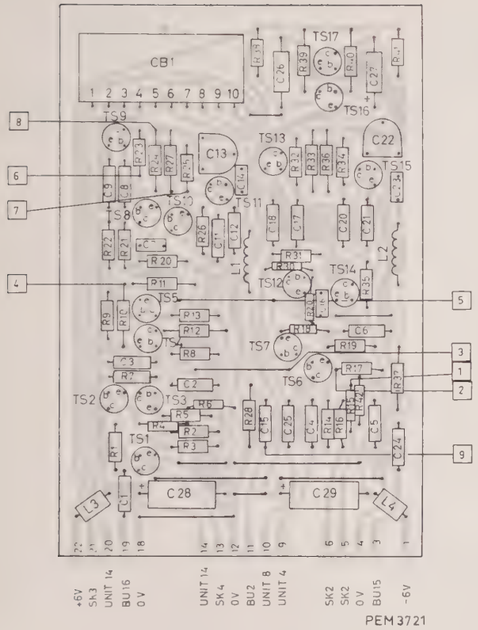


Fig. X-2 Printed wiring board, subcarrier output, unit 3

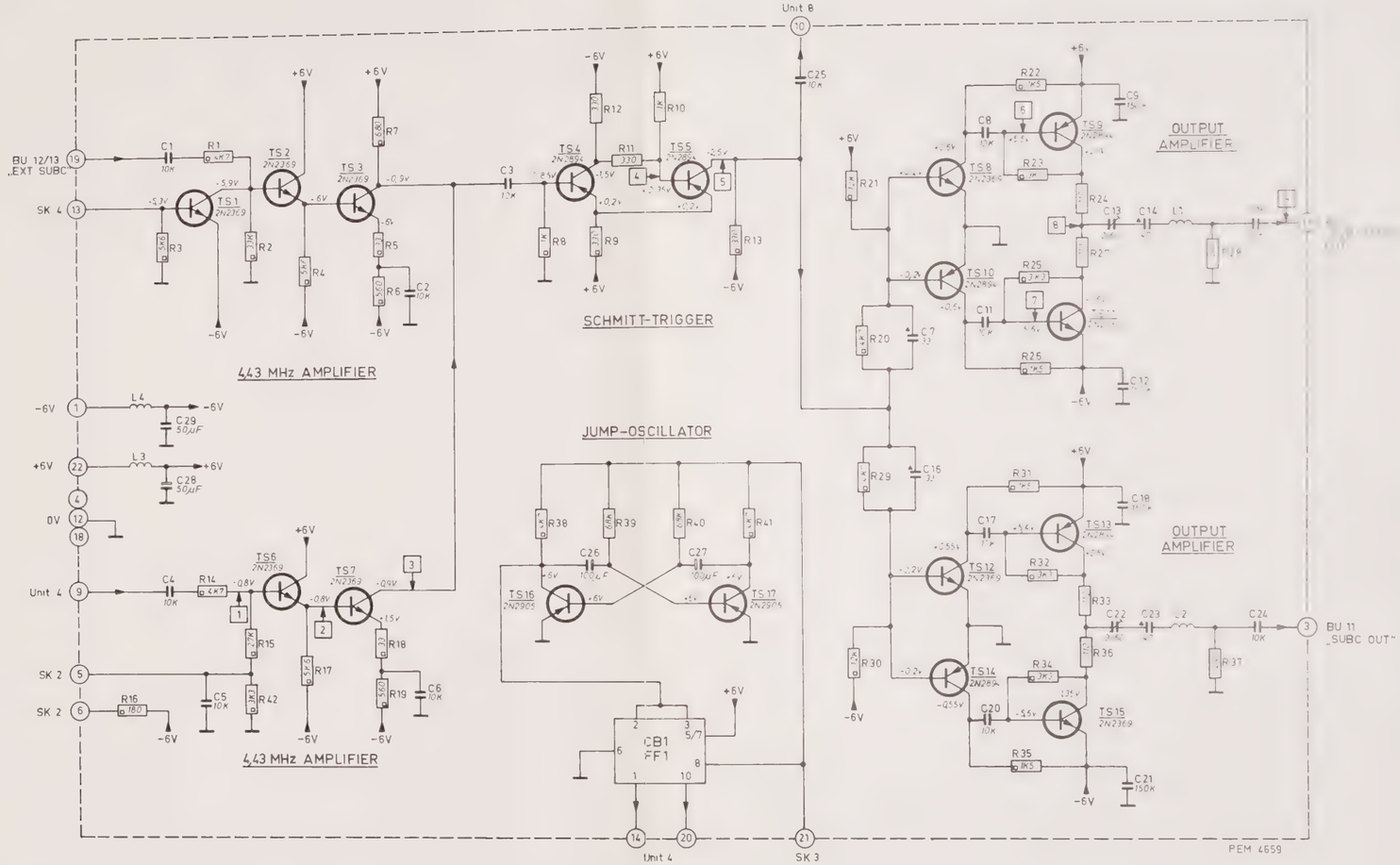


Fig. X-3 Circuit diagram, subcarrier output, unit 3

XI Unit 4

Sub-carrier oscillators

This unit contains three identical oven-controlled crystal oscillators.

Sub-carrier oscillator (4.433619 MHz)

This oscillator consists of TS1-TS2 and crystal X1. By depressing SK2 (front of the instrument) TS3 is saturated (—6 V via R9) so that R7 and the base of TS2 are on common level, causing the oscillator to start. The oscillator has a high temperature stability. The d.c. stabilisation is effected by the high emitter- and low base resistance.
The a.c. loop gain exceeds 1 only if the impedance of the crystal is low with repect to the input impedance of the common-base transistor circuit. This ensures stable oscillation in the series-resonance condition of the crystal.
With the aid of C4 the oscillator can be tuned to the exact sub-carrier frequency. Due to the thermostat-controlled oven and the type of crystal, it has been achieved that the frequency deviation is less than 1 Hz over the entire temperature range due to the oven temperature cycling.

Sub-carrier oscillators (4.433619 MHz ± 100 Hz)

These oscillators are operating only if SK3 "SUB-CARRIER JUMP" (front of the instrument) is depressed. Their operation is similar to that described before. These oscillators are started and stopped via TS6 and TS9, which are controlled by the d.c. voltage levels from the jump oscillator circuit of unit 3.

Checking and adjusting

Measuring equipment:
Frequency counter (5 MHz, accuracy 1 Hz): e.g. HP 5245L

1. Sub-carrier oscillator (4.433619 MHz)

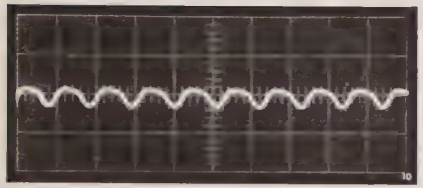
Connect counter to BU2 "SUBC I OUT".
Depress SK2 "SUB-CARRIER INT".
Check the frequency, this should be 4.433619 MHz.
If not, re-adjust C4.

2. Sub-carrier oscillator (4.433619 MHz —100 Hz)

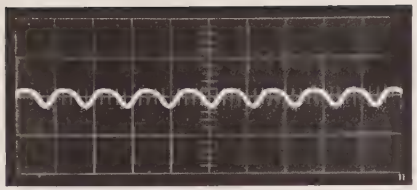
Connect counter to BU2 "SUBC. I OUT".
Unsolder R15 and R23 (at collectors of TS6 and TS9).
Connect R15 to terminal 12 (common).
Depress SK3 "SUB-CARRIER JUMP".
Check the frequency this should be 4.433519 MHZ.
If not, re-adjust C10.
If not proceeding with next check, resolder R15 and R23 to the collectors of TS6 and TS9.

3. Sub-carrier oscillator (4.433619 MHz + 100 Hz)

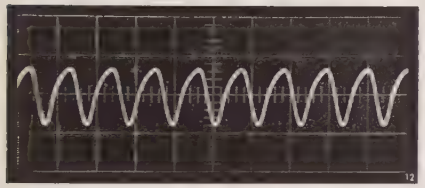
Connect counter to BU2 "SUBC. I OUT".
Unsolder R15 and R23 (at collectors of TS6 and TS9).
Connect R23 to terminal 12 (common).
Depress SK3 "SUB-CARRIER JUMP"
Check the frequency, this should be 4.433719 MHz
If not, re-adjust C16.
Resolder R15 and R23 to collectors of TS6 and TS9.



10 0.5 V/cm 0.2 µs/cm



11. 0.5 V/cm 0.2 µs/cm



12. 2 V/cm 50 µs/cm

Fig. XI-1 Oscillograms, unit 4

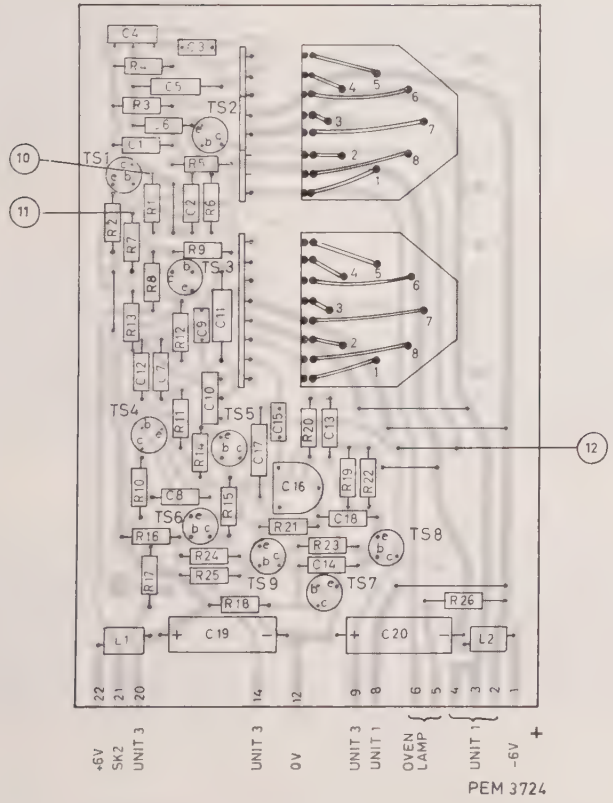


Fig. XI-2 Printed wiring board, sub-carrier oscillator, unit 4

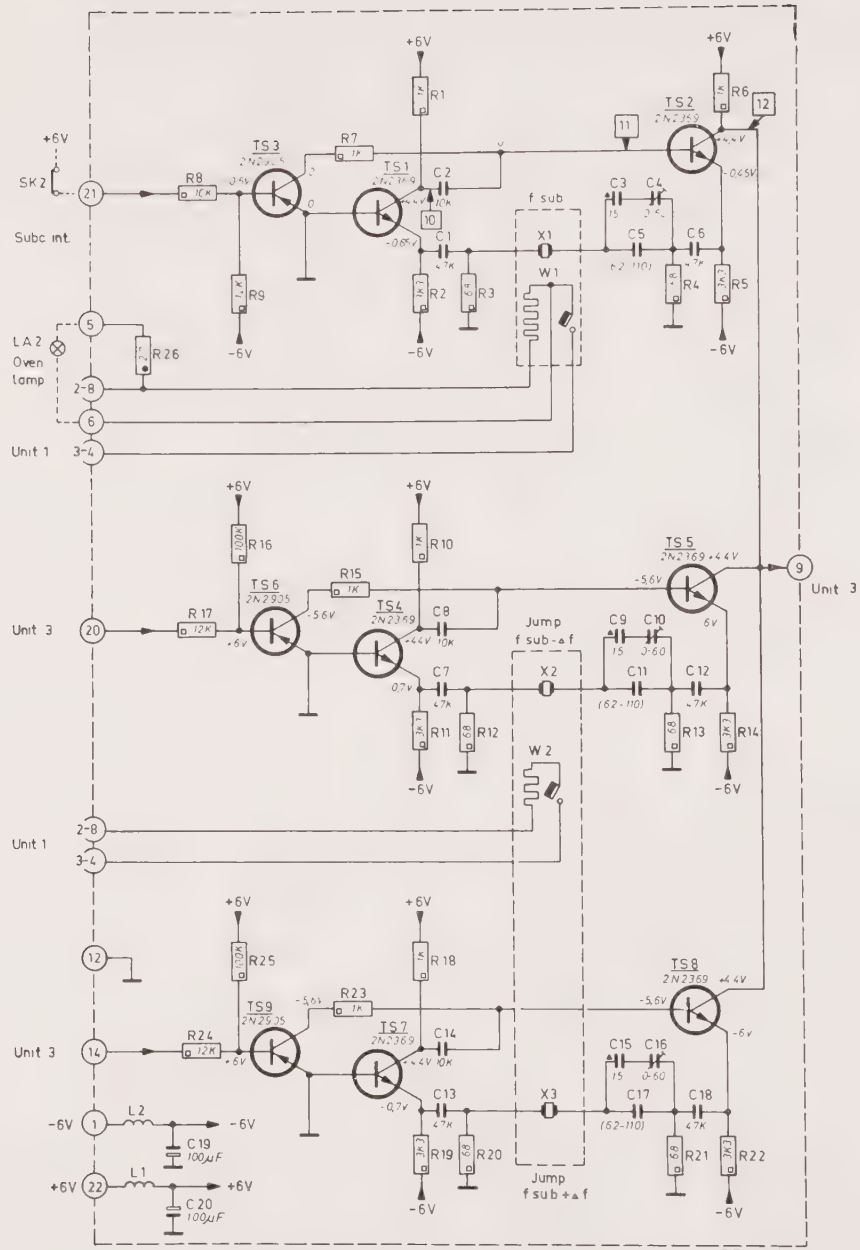


Fig. XI-3 Circuit diagram, sub-carrier oscillator, unit 4

XII Unit 6

Sub-carrier divider

The purpose of this circuit is to produce a control voltage by means of which the pilot frequency is locked to $f_{SUB-CARRIER}$—25 Hz in unit 7.
The control voltage is obtained by comparing the f_{SC}—25Hz-frequency = 4433593.75 Hz with one quarter of the line frequency (= 3906.25 Hz). This comparison is made in discriminator TS3. One quarter of the line frequency is obtained by dividing the pilot frequency (= 125 kHz) in 5 binary dividers (32 : 1 dividers). The pilot frequency has already been divided 4 : 1 by CB1 and CB2 in unit 7 and again divided 8 : 1 in the binary dividers CB1, CB2 and CB3 in this unit. After differentiation across C1-R1, the signal ($\frac{1}{4}$fH) is applied to blocking oscillators TS1 and TS2. TS1 functions as driver transistor. Each positive going variation of the incoming signal starts the blocking oscillator for one cycle as TS2 is kept in the non-self-oscillating condition by a small negative voltage on its base. The blocking oscillator generates a small "spike" voltage having a pulse width of about 60 ns at the bottom of the pulse.
This pulse is applied between the base and emitter of discriminator TS3, via the extra transformer winding S2 and the RC network R5/R6-C3. Diode GR2 prevents the transformer from producing unwanted oscillations after the "spike" pulses. The sub-carrier signal (low source impedance) is applied via the buffer amplifier TS4 to the emitter of TS3. In the discriminator the phase of the f_{SC}—25 Hz-frequency is compared with the pilot frequency. At every positive "spike" transistor TS3 is bottomed, thus forming a short-circuit between sub-carrier source and collector. As a result of this C5 will then be charged or discharged to the same level as the momentary value of the (f_{SC}—25 Hz)-sine wave.

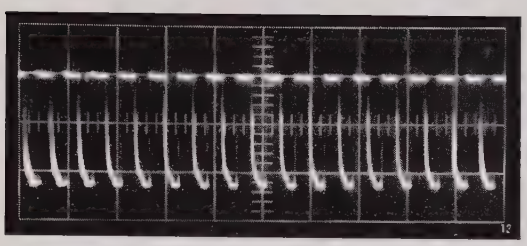
In this way the discriminator is every $\frac{4433593.75}{3906.25} =$ 1135th cycle "sampling" the (f_{SC}—25 Hz) signal.
Consequently the level across C5 is an indication of the phase-difference between the pilot signal and the (f_{SC}—25 Hz)-signal.
This d.c. level is applied to the reactance circuit in unit 7 via the differential amplifier TS5...TS8 and emitter followers TS9 and TS10.

Checking and adjusting

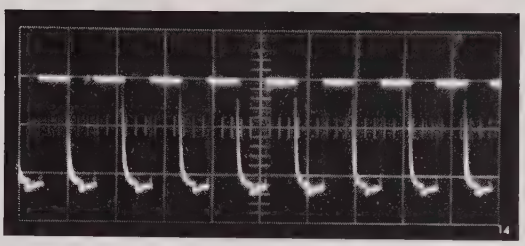
Measuring equipment:
Oscilloscope: e.g. PHILIPS PM 3330
with Y-amplifier: e.g. PHILIPS PM 3332

"Sub-carrier" amplitude

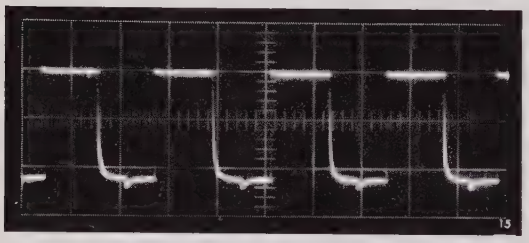
Connect oscilloscope to emitter TS4.
The "sub-carrier" amplitude should be 1.5 V_{p-p}
If not, re-adjust R9.



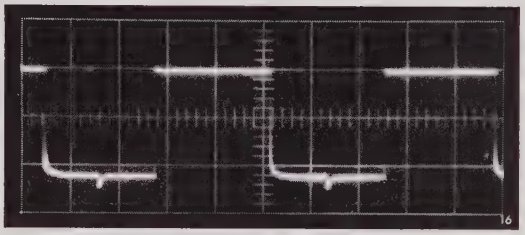
13. 2 V/cm 50 μs/cm



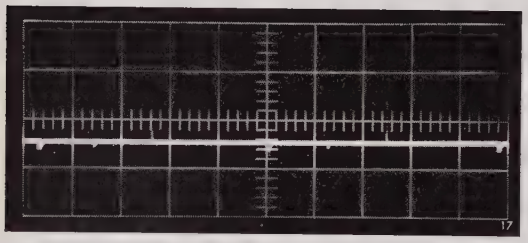
14. 2 V/cm 50 μs/cm



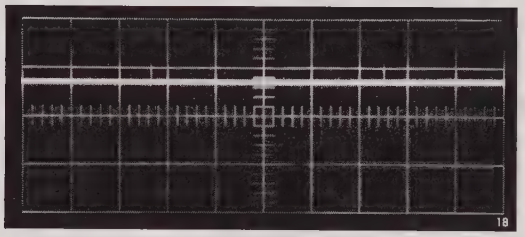
15. 2 V/cm 50 μs/cm



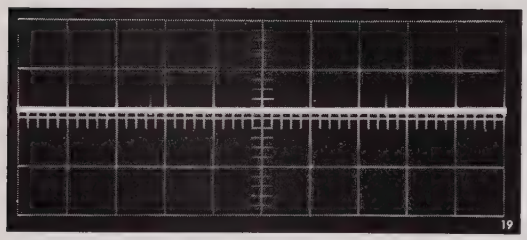
16. 2 V/cm 50 μs/cm



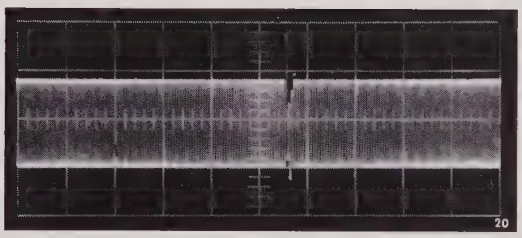
17. 1 V/cm 50 μs/cm



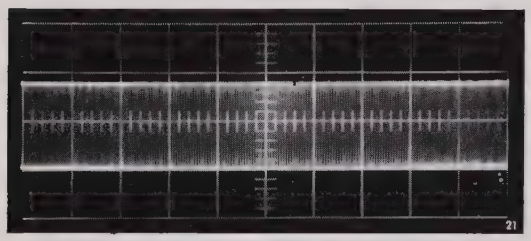
18. 2 V/cm 50 μs/cm



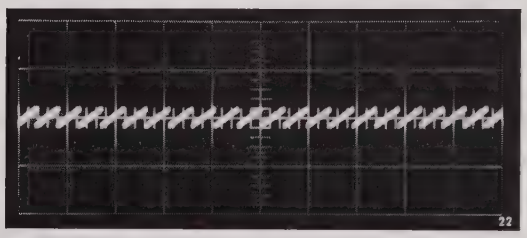
19. 1 V/cm 50 μs/cm



20. 1 V/cm 4 μs/cm



21. 1 V/cm 4 μs/cm



22. 0.2 V/cm 1 μs/cm

Fig. XII-1 Oscillograms, unit 6

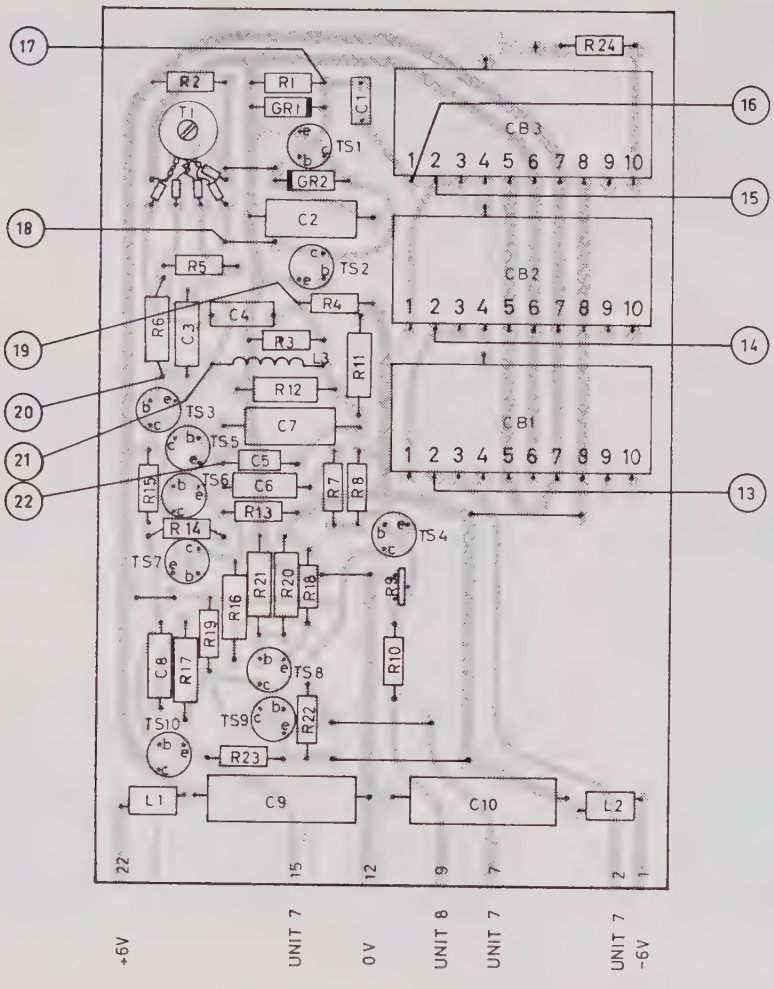


Fig. XII-2 Printed wiring board, sub-carrier divider, unit 6

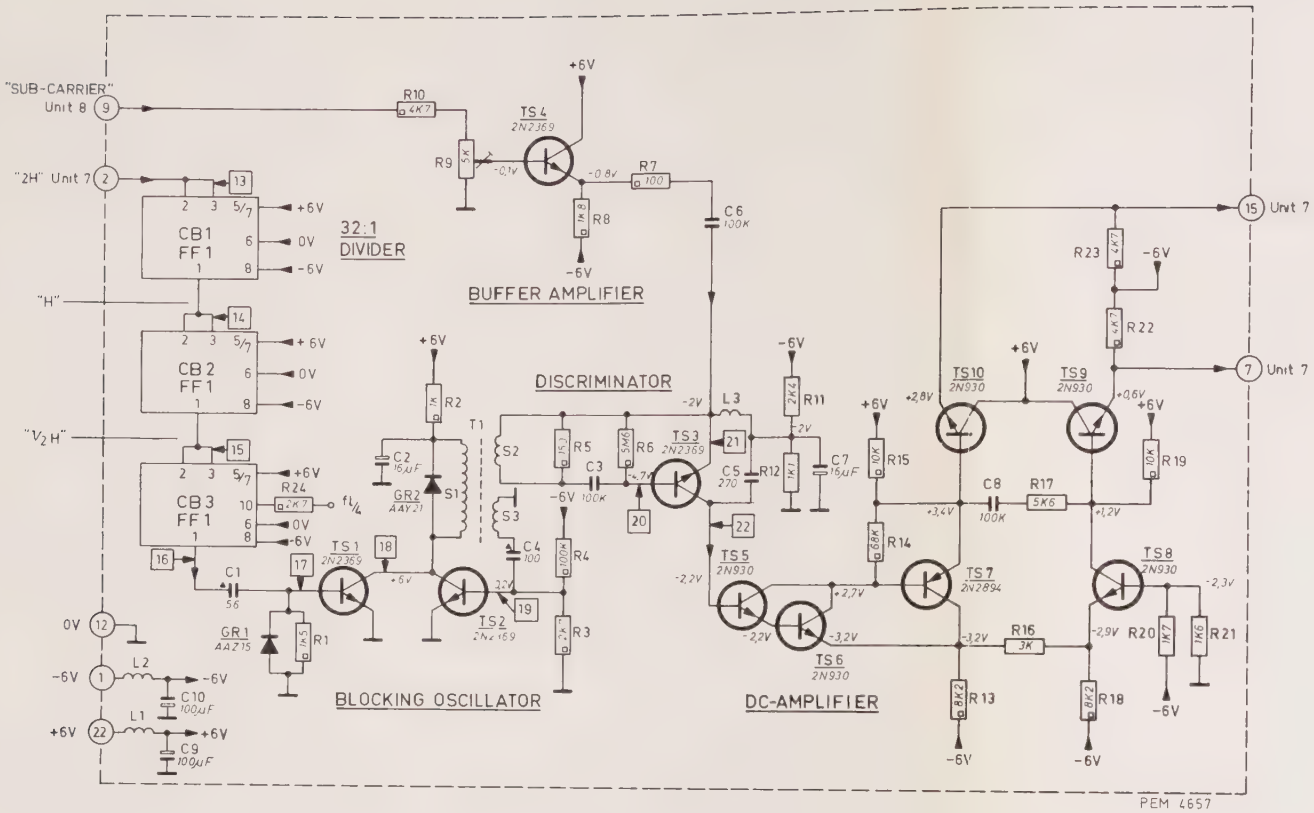


Fig. XII-3 Circuit diagram, sub-carrier divider, unit 6

XIII Unit 7

Pilot oscillator

In the PAL system, the sub-carrier frequency (f_{SUB}-25 Hz), 4.433593.75 MHz, is exactly 283.75 times the line frequency.

In view of this, the pilot frequency (125 kHz) from which TV pulse generator PM 5530 derives all driving, synchronizing and blanking signals, is produced in this unit.

The pilot oscillator TS1 and TS2 is a crystal controlled Colpitts oscillator, oscillating in the parallel resonance mode.

Transistor TS2 is the direct current source for TS1 with a very high a.c. impedance, necessary for the feedback in the oscillator.

To lock the pilot oscillator frequency and phase to the sub-carrier frequency, the pilot oscillator is controlled with the d.c. voltage from the discriminator in unit 6 via the reactance circuit GR1, GR2, C4, C5 and C6.

Via buffer amplifier TS3 and TS4 the pilot signal is applied to 4 : 1 divider CB1-CB2 in this unit followed by 8 : 1 divider CB1...CB3 in unit 6.

The output amplifier TS6...TS9 is of the push-pull type, TS6 and TS8 amplify the positive part of the signal while TS7-TS9 amplify the negative part.

GR3 and GR4 ensure the correct base levels for TS6 and TS7.

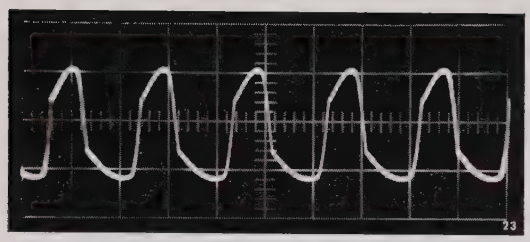
By re-soldering, the 125 kHz ($8 \times f_{LINE}$ = "8H") or the 31.25 ($2 \times f_{LINE}$ = "2H") can be selected as a pilot signal. When the instrument is delivered, the pilot frequency is adjusted to 31.25 kHz (2H).

Checking and adjusting

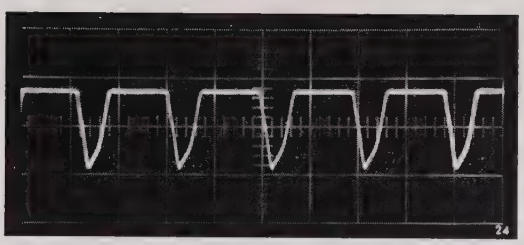
Measuring equipment:
Frequency counter (approx. 150 kHz.) e.g. HP 5245L

Pilot oscillator frequency

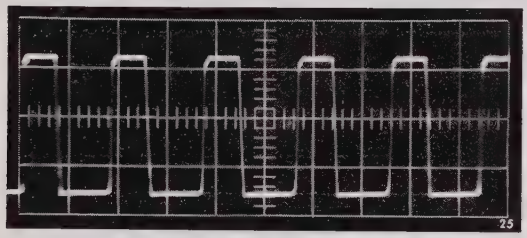
Depress SK2 "SUB-CARRIER INT".
Remove unit 6.
Connect counter to BU6 "PILOT".
The frequency should be between 125035 Hz and 125040 Hz. If not, select another value for C2 (820–1800 pF) until the correct frequency is obtained.
Refit unit 6



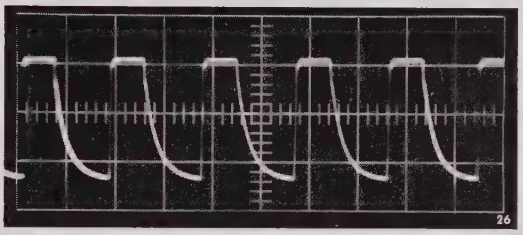
23. 2 V/cm 4 µs/cm



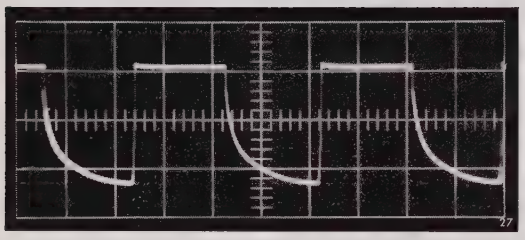
24. 2 V/cm 4 µs/cm



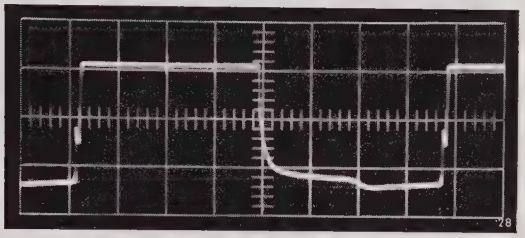
25. 2 V/cm 4 µs/cm



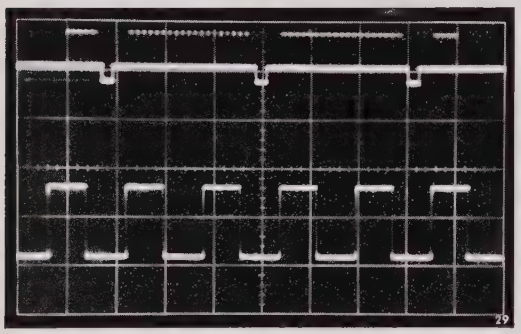
26. 2 V/cm 4 µs/cm



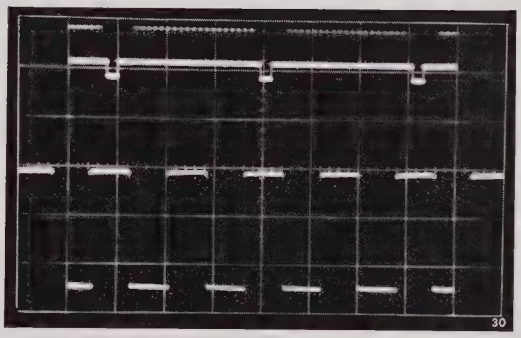
27. 2 V/cm 4 µs/cm



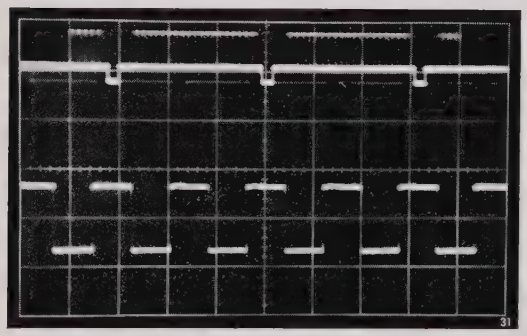
28. 2 V/cm 4 µs/cm



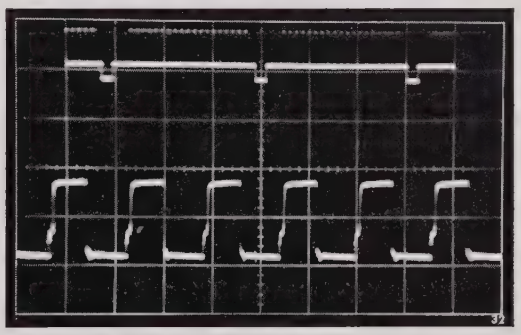
29. 1 V/cm 20 µs/cm
reference: "VIDEO I OUT"



30. 2 V/cm 20 µs/cm
reference: "VIDEO I OUT"

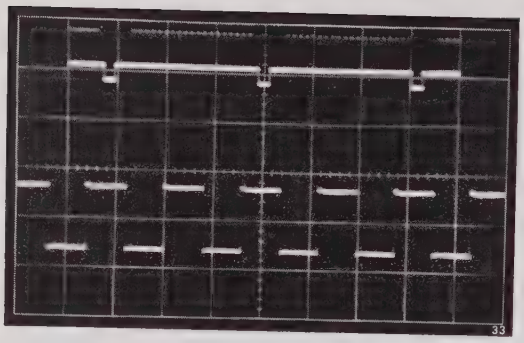


31. 1 V/cm 20 µs/cm
reference: "VIDEO I OUT"

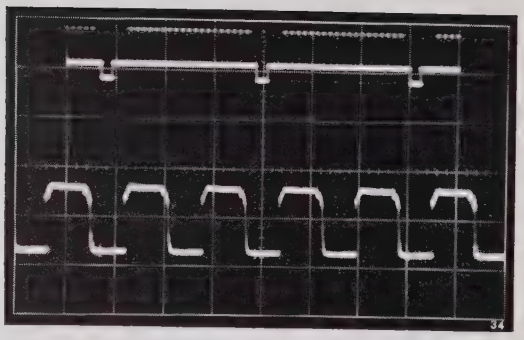


32. 0.5 V/cm 20 µs/cm
reference: "VIDEO I OUT"

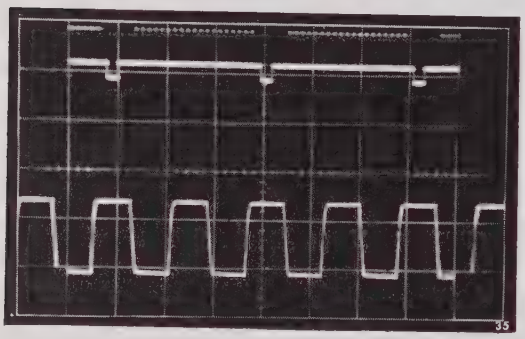
Fig. XIII-1 Oscillograms, unit 7



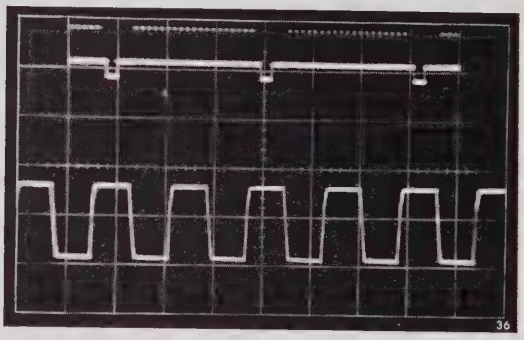
33. 1 V/cm 20 µs/cm
reference: "VIDEO I OUT"



34. 0.5 V/cm 20 µs/cm
reference: "VIDEO I OUT"



35. 5 V/cm 20 µs/cm
reference: "VIDEO I OUT"



36. 5 V/cm 20 µs/cm
reference: "VIDEO I OUT"

Fig. XIII-1 Oscillograms, unit 7

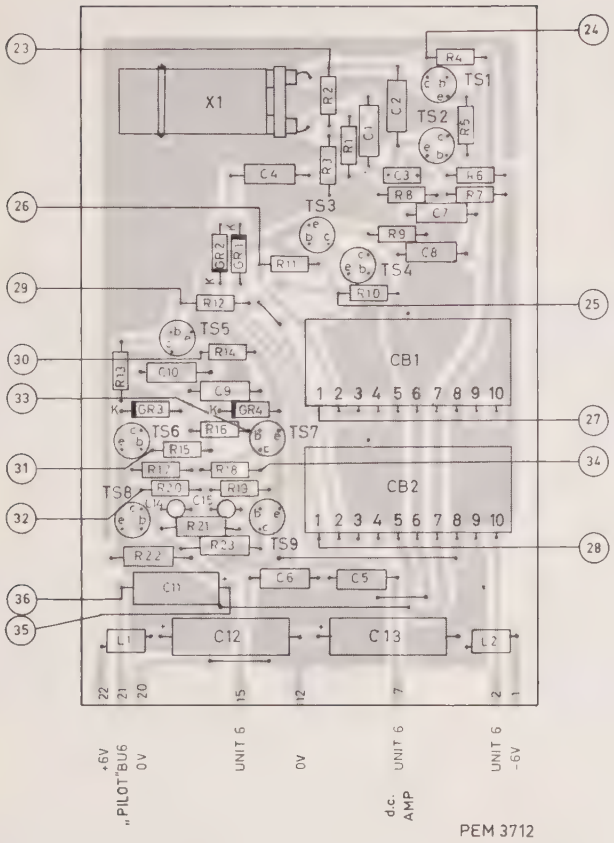


Fig. XIII-2 Printed wiring board, pilot oscillator, unit 7

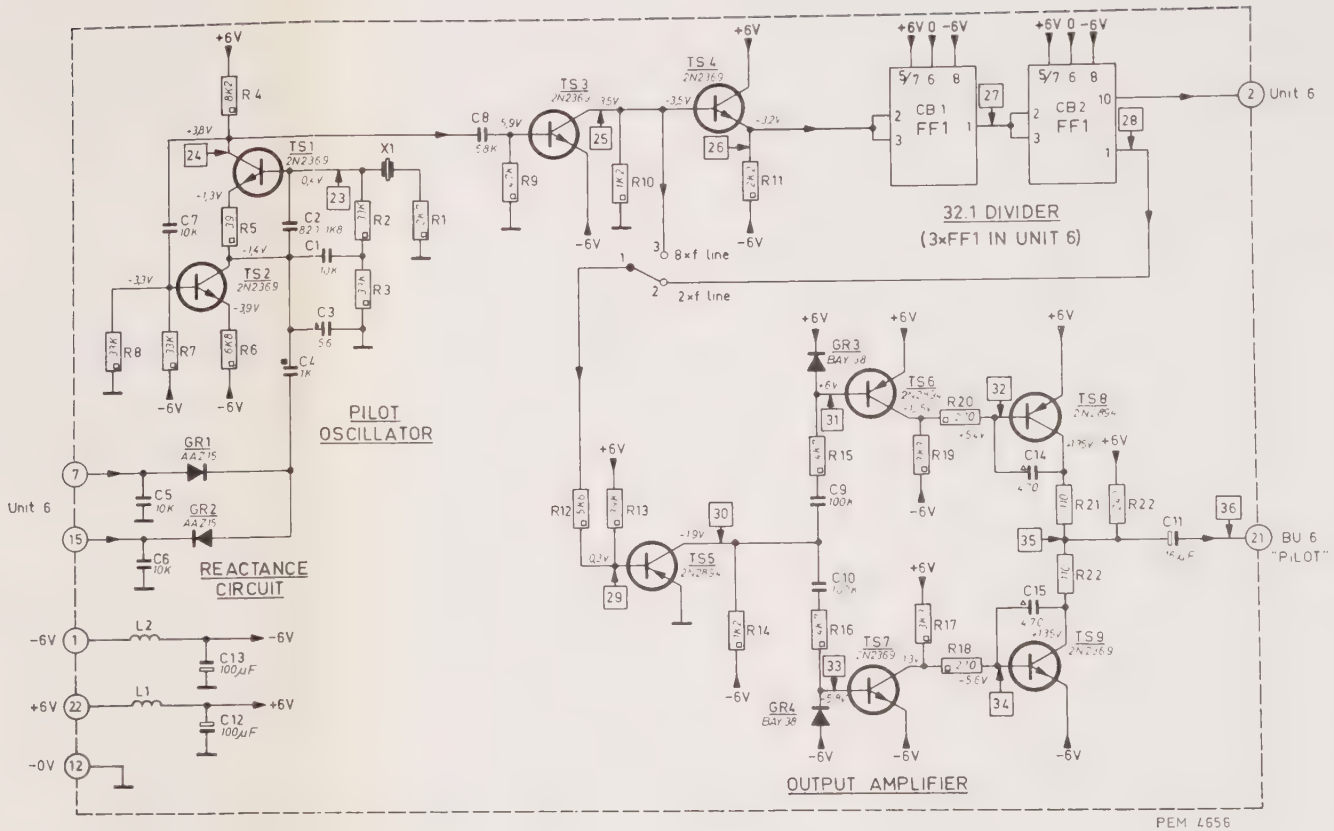


Fig. XII-3 Circuit diagram, pilot oscillator, unit 7

XIV Unit 8

25 Hz off-set circuit

The sub-carrier is applied from terminal 10 to phase-shift circuits C5/R6 (+45°) and R12/C10-C11 (—45°) via TS1 and TS2.
The filter L1/C1-C2 prevents higher harmonics of the sub-carrier frequency from gaining access to the modulators.
C5/R6 shifts the phase of the sub-carrier signal +45°, and R12/C10-C11, —45°.
To reduce the capacitive load of the phase shifting circuits on TS2, the latter is provided with a reactance circuit (L2) in the emitter. A 25 Hz sine wave signal is applied via terminals 13/14, a 25 Hz cosine wave signal is applied via terminals 16/17. These signals are phase shifted 90° with respect to each other.
The sub-carrier is used as a carrier wave, while the two 25 Hz waves are used as modulation frequencies in the ring modulators. The output signal of the parallel connected modulator outputs has a frequency of f_{SUB}. —25 Hz (single side band modulation).
In fig. XIV-1 this single side band modulation has been explained by making use of goniometrical principles.
For the sake of simplicity the signal amplitudes have been omitted.
This off-set signal is applied to inverter amplifier TS7 via TS5 and TS6. The circuits L7/C17 and L9/C20 are tuned to (f_{SUB}. —25 Hz). The sine wave signal, thus obtained, is applied to terminal 21 via TS8. The signal is used to control the pilot oscillator in unit 6.

Checking and adjusting

Measuring equipment:

Oscilloscope:	e.g. PHILIPS PM 3330
with Y-amplifier:	e.g. PHILIPS PM 3332

Sine wave signal

Depress SK2 "SUB-CARRIER INT."
Connect oscilloscope to terminal 21. The signal should be a sinewave. If not, adjust to correct sinewave by means of C20 and, if necessary, by means of C17. The voltage should be approx. 8 V_{p-p}.

For adjusting C11 refer to unit 9.

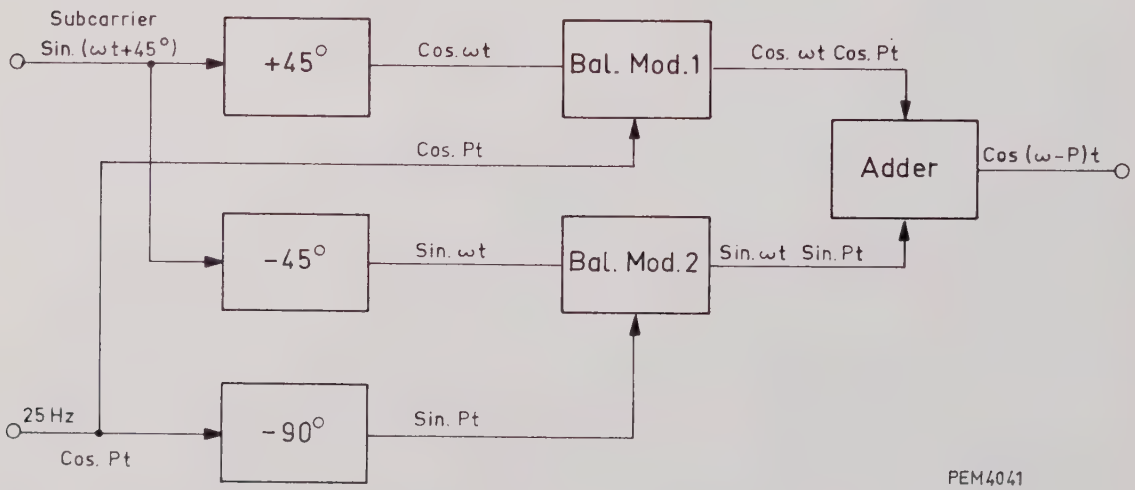
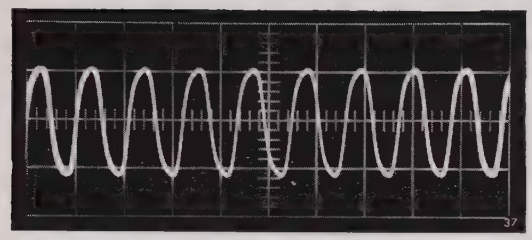
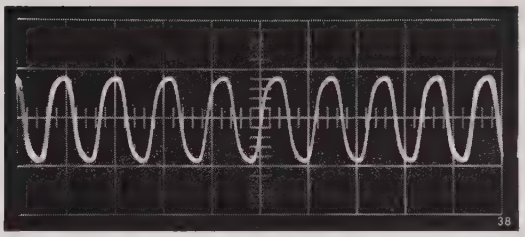


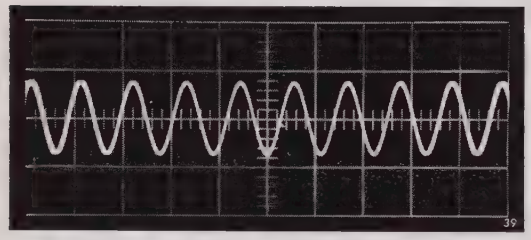
Fig. XIV-1 Goniometrical principle of balanced modulators



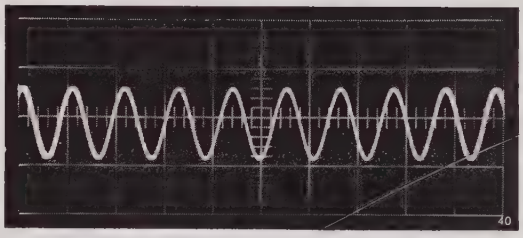
37. 2 V/cm 0.2 μs/cm



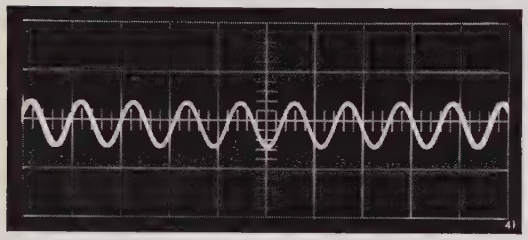
38. 2 V/cm 0.2 μs/cm



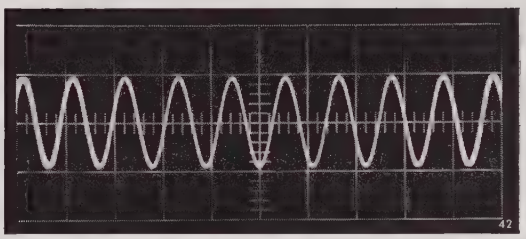
39. 2 V/cm 0.2 μs/cm



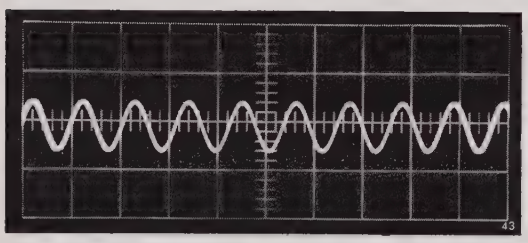
40. 2 V/cm 0.2 μs/cm



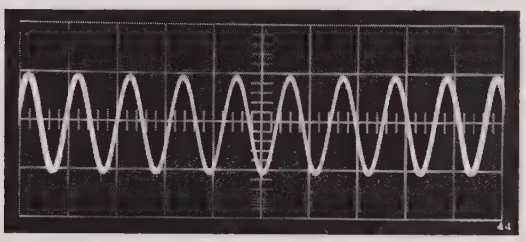
41. 2 V/cm 0.2 μs/cm



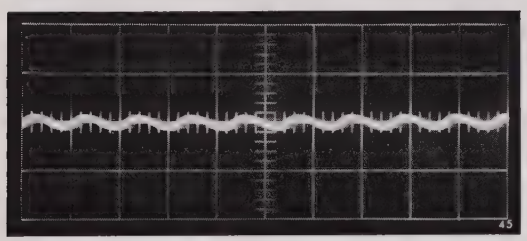
42. 1 V/cm 0.2 μs/cm



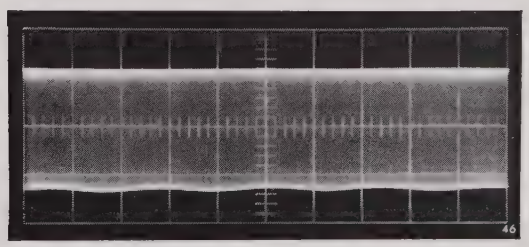
43. 2 V/cm 0.2 μs/cm



44. 1 V/cm 0.2 μs/cm

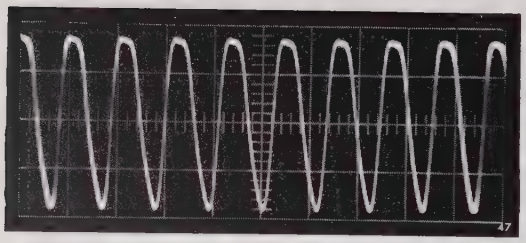


45. 0.5 V/cm 0.2 μs/cm

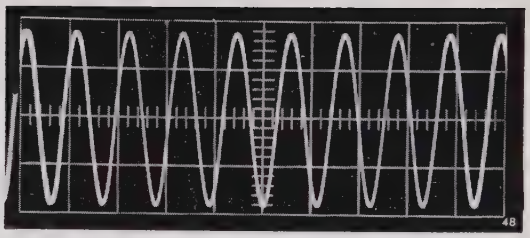


46. 1 V/cm 4 μs/cm

Fig. XIV-2 Oscillograms, unit 8



47. 1 V/cm 0.2 µs/cm



48. 2 V/cm 0.2 µs/cm

Fig. XIV-2 Oscillograms, unit 8

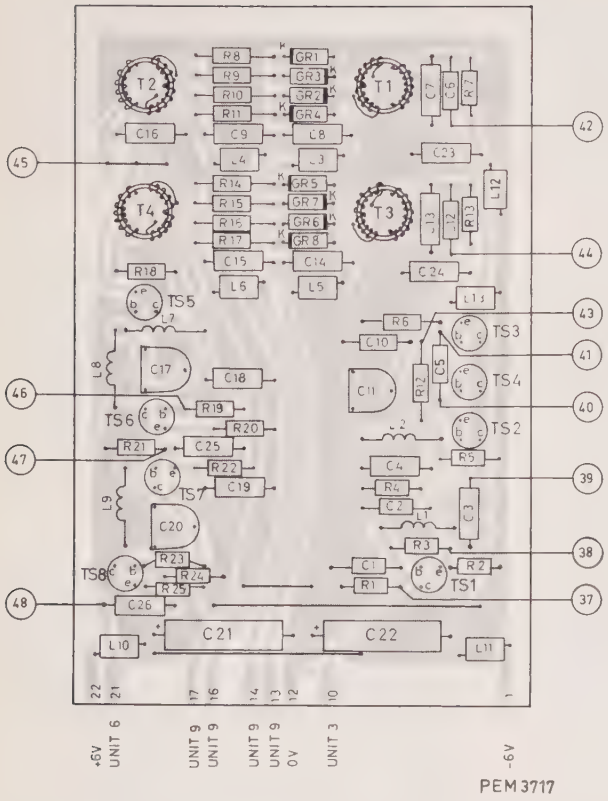


Fig. XIV-3 Printed wiring board, 25 Hz off-set circuit, unit 8

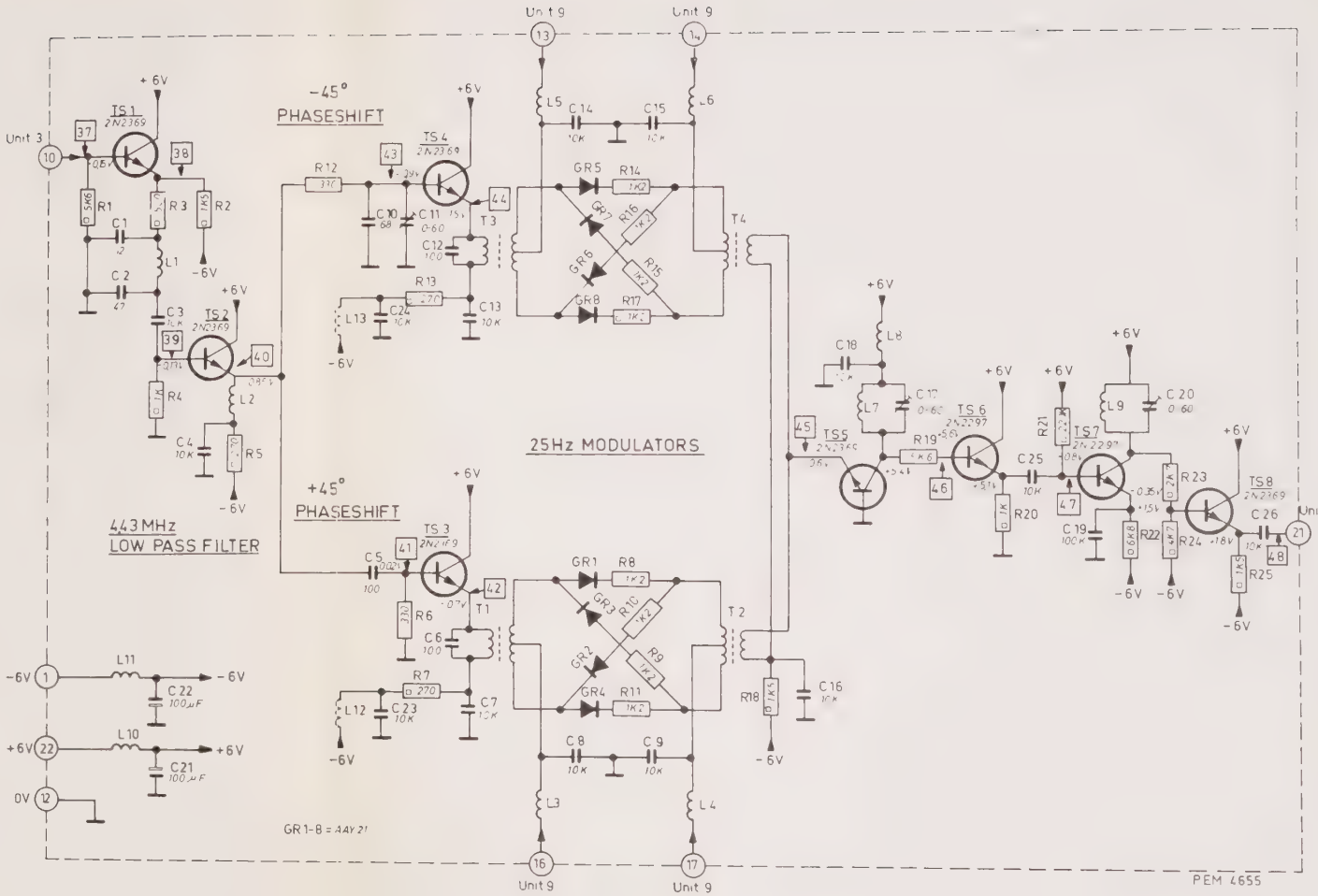


Fig. XIV-4 Circuit diagram, 25 Hz off-set circuit, unit 8

XV Unit 9

25 Hz sinewave generator

In this unit the 25 Hz sine and cosine signals are generated. These signals are used as modulation frequencies for the two balanced modulators in unit 8. Frame pulses "V3" are applied to the 2 : 1 divider CB1 via terminal 9. The output signals of the divider are squarewave pulses of 25 Hz. These pulse are passed through the low-pass filter consisting of the integrating circuits R3/C2, R6/C3, R7/C4 and R10/C6 and emitter followers TS1-TS4.

These emitter followers serve for keeping a constant signal through the filters and for impedance correction between the integrating circuits. The sinewave signal thus obtained is applied to the negative feedback amplifier TS5-TS6. This amplifier has a high input impedance and a low output impedance. It serves to prevent overloading of the integrating circuit R10/C6. The 25 Hz sinewave signal is applied to the balanced driver amplifiers TS7-TS9 and TS10-TS12 via the —90° phase-shifting circuit C7/R13+R14, where the cosine signal is created. The output stages of these amplifiers are balanced by R22 and R31, so that only the a.c. components of the signals are present. The amplification of the two output stages is adjustable with R20 and R29. The direct and the —90° phase-shifted signals are applied to the off-set modulators in unit 8 via terminals 13/14 (sine) and 16/17 (cosine).

Checking and adjusting

Measuring equipment:

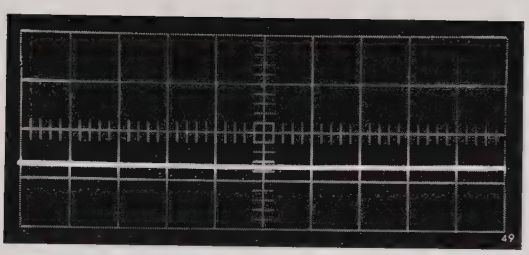
Oscilloscope:	e.g. PHILIPS PM 3330
with Y-amplifier:	e.g. PHILIPS PM 3332

Balance of the off-set modulator

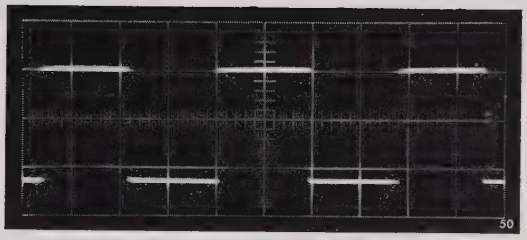
Disconnect the "V3" pulse input signal at terminal 9 of unit 9.

Connect oscilloscope to terminal 21 of unit 8.

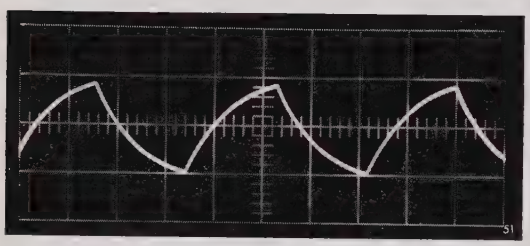
The modulators are balanced, if minimum deflectiou (rest-carrier) on the oscilloscope is obtained. If not, re-adjust to minimum deflection by means of R20-R22 and R29-R31 and, if necessary, with C11 in unit 8. Connect the "V3" pulse input signal to terminal 9 of unit 9 again.



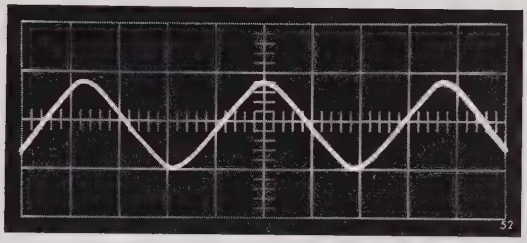
49. 2 V/cm 10 ms/cm



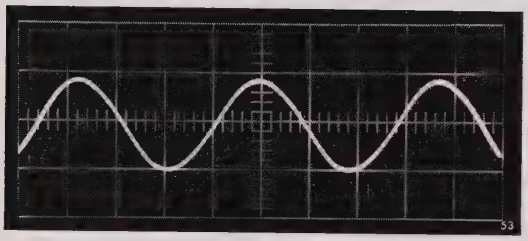
50. 2 V/cm 10 ms/cm



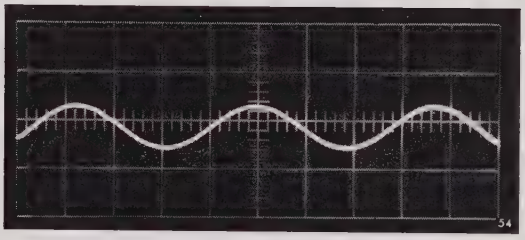
51. 2 V/cm 10 ms/cm



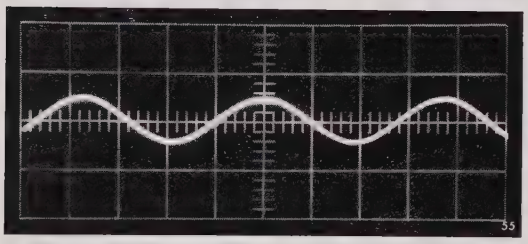
52. 1 V/cm 10 ms/cm



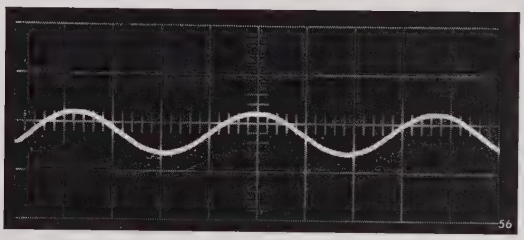
53. 0.5 V/cm 10 ms/cm



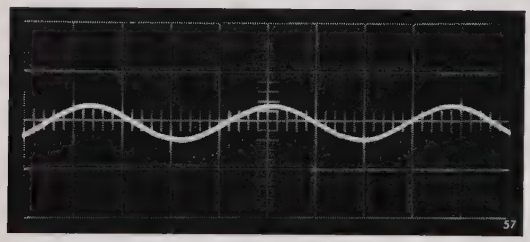
54. 0.5 V/cm 10 ms/cm



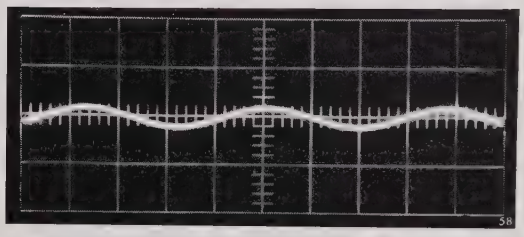
55. 0.5 V/cm 10 ms/cm



56. 0.5 V/cm 10 ms/cm

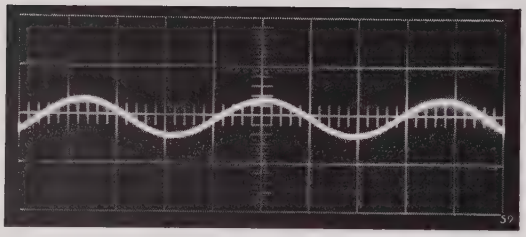


57. 0.5 V/cm 10 ms/cm

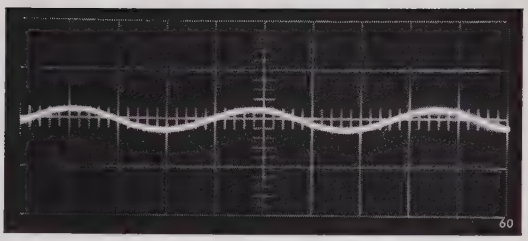


58. 0.5 V/cm 10 ms/cm

Fig. XV-1 Oscillograms, unit 9



59. 0.5 V/cm 10 ms/cm



60. 0.5 V/cm 10 ms/cm

Fig. XV-1 Oscillograms, unit 9

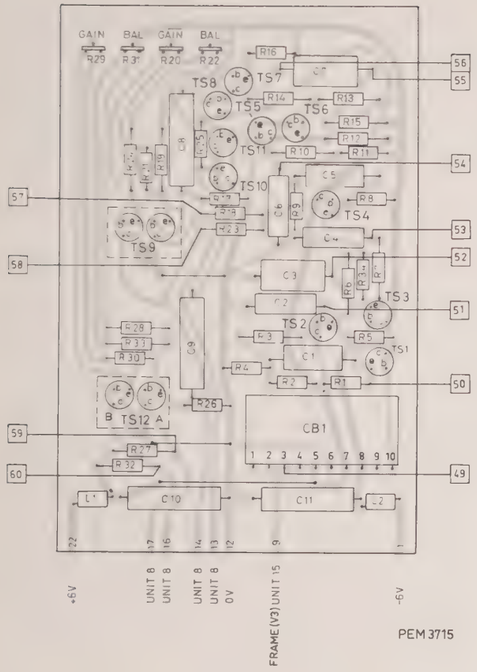


Fig. XV-2 Printed wiring board, 25 Hz sine wave generator, unit 9

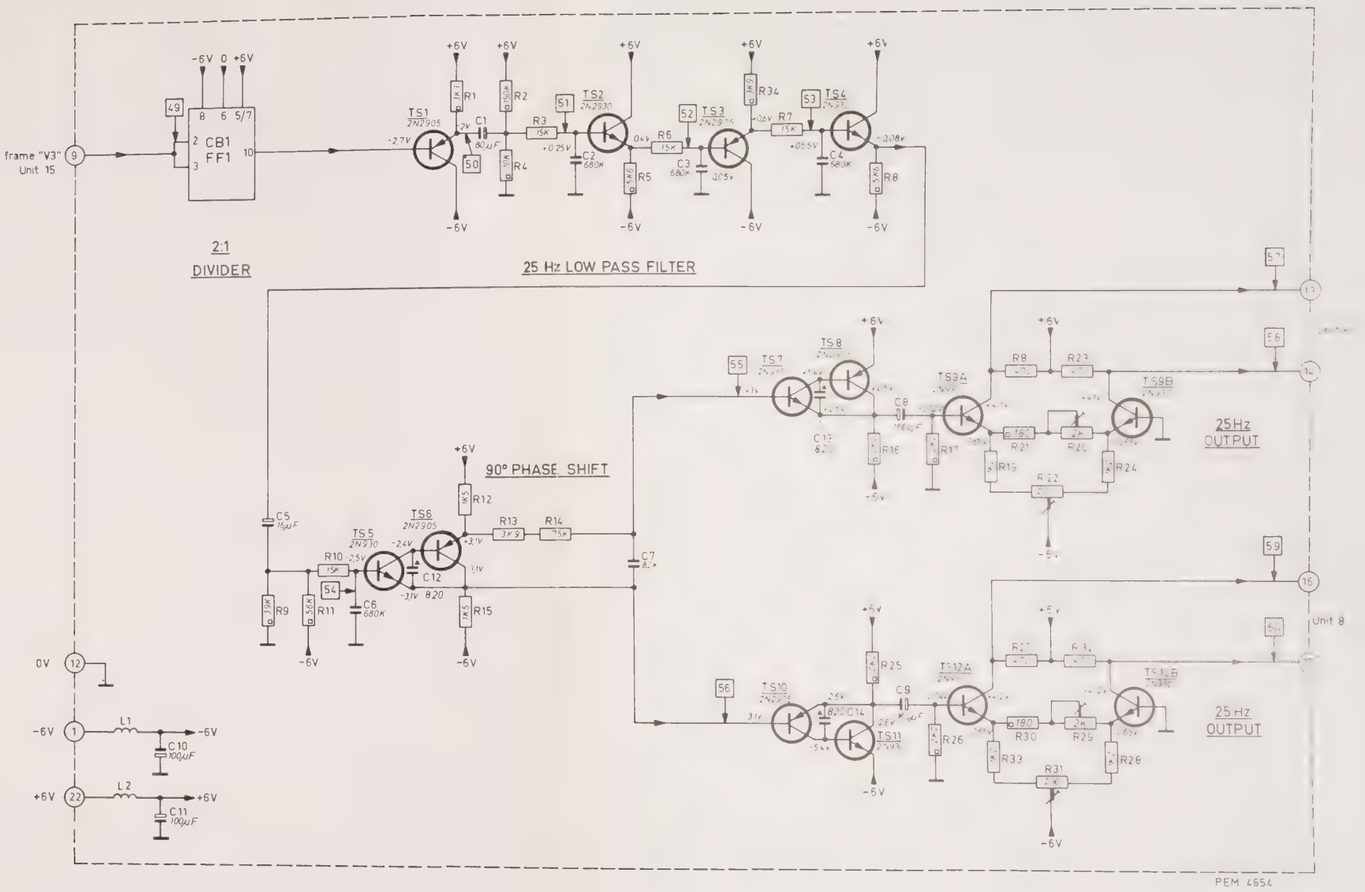


Fig. XV-3 Circuit diagram, 25 Hz sine wave generator, unit 9

XVI Unit 10

Video output

This units contains the following circuits.
1. 12½ Hz generator
2. Blanking input circuit
3. Adder circuit and video output amplifiers.

12½ Hz Generator

The 12½ Hz pulse is generated in CB1 and controlled by trigger pulses in the 2nd field (see Fig. XVI-2).
Input 2 of CB1 is controlled by the positive-going transient of the negative field pulses (V2, 48 µs) from unit 15.
Input 4 of CB1 is controlled by the negative-going transient of the negative pulses from and-gate GR4/GR5 via emitter follower TS9.
As the start of the 2nd field, CB1 is activated by the positive-going transient of pulse "V2". At the start of the 3rd field CB1 is activated again by the negative-going transient of the gate output pulse (GR4/GR5). At the start of the 4th and 1st field, CB1 remains clamped as both inputs are not back-biased, because both pulses coincide and have the same width (48 µs).
At the start of the next 2nd field CB1 will be activated again by the positive-going transient of pulse "V2" because the negative-going transient of the gate output pulse does not influence the setting of CB1. The output pulse of CB1 has a width of 20 ms —48 µs. A negative or positive output pulse can be selected by resoldering output 1 ("—") or output 10 ("+") respectively.
This signal is applied to one-shot circuit TS11 and integrating circuit C11/R30-R34-R35-R36 via TS10. TS11 is triggered by the positive-going transient of the negative output pulse of CB1 or by the positive-going transient of the positive output pulse of CB1, depending on the connection made to the outputs 1 or 10 of CB1.
The positive-going transient of the output pulse drives TS11 into cut-off for a time which is determined by the discharged time of C11. This discharged time corresponds to "delay time a, b and c" (see Fig. XVI-2). The delay time determined by the RC time C11/R30-R36, is dependent on which discharge resistor is selected. (see section VIII-D).

From TS11 a pulse is applied to one-shot circuit TS13, TS14 via C12. This circuit is triggered by the positive going transient of the output pulse of TS11.
Dependent on the selected delay time (a, b or c, see Fig. XVI-2) and the pulse polarity of CB1, the pulse from TS14 can be selected so that it occurs during the field synchronizing period of one out of four successive fields. (numbered 4th, 1st, 2nd and 3rd field in Fig. XVI-2).
The 15 ms pulse, derived from TS14 is applied to and-gate GR7-GR8 together with the field sync. pulse "V1".
The output pulse of this gate appears as a negative pulse and is present in every 4th field (12½ Hz).
The pulse width is determined by the field sync. pulse "V1".
The 12½ Hz pulse is applied to BU7 "12½ Hz" via TS16... TS18 and terminal 13.

Blanking input circuit

This circuit consists of emitter follower TS1, keyed clamping circuit TS2/GR1 and pulse shaper TS3. The blanking pulses are applied to TS3 via TS1 and terminal 3. TS3 is biased so that only the centre part of the blanking pulses is amplified. TS3 also eliminates possible distortion of the blanking pulses. Clamping circuit TS2/GR1 is used to compensate for possible hum on the applied blanking pulses. The blanking pulses are applied to terminal 16 and to the adder circuit via inverter TS4.

Adder Circuit and Video output amplifiers

The adder circuit consists of R11-R16 and R18/R19. The blanking pulses are applied to the adder circuit via R11/R12. The sync. signal via R15/R16 and the video signal via R13/R14.
The composite video signal from the adder circuit is applied to output amplifiers TS5/TS6 and TS7/TS8.
These amplifiers are two identical negative feedback amplifiers having a high input impedance and a low output impedance (75 Ω).
The output voltage is 1 V_{p-p}, if loaded with 75 Ω.

Checking and adjusting

Measuring equipment:
oscilloscope: e.g. PHILIPS PM 3330
with 4-trace unit: e.g. PHILIPS PM 3344

Symmetry and location of 12.5 Hz pulse

Connect the A amplifier of oscilloscope to connection 1 of CB1, B amplifier to terminal 7 ("V1" pulse), C amplifier to collector of TS14 and D amplifier to base TS16. Trigger with B signal.
The oscillogram should be as shown in Fig. XVI-1. If the interconnections are in positions "1" and "b", the pulse should be symmetrical around "60 ms" (= synchronizing period first field). If not, select another value for R35 (56 kΩ — 82 kΩ).
If the interconnections are in positions "1" and "c", the pulses should be symmetrical around "80 ms" (= synchronizing period second field). If not, select another value for R30 (270 kΩ — 560 kΩ).

Adder circuit (only if units 11 and 12 are present: PM 5558).
Connect oscilloscope to terminal 17 or 18.
Depress switch "INT. PATTERN-LINES" (SK5). Check that in the complete video signal on terminals 17 or 18:
- there is no set-up*.
- the picture-contents is 72%. If not, select another value for R14
- the sync. amplitude is 28%. If not, select another value for R16.
- the amplitude of the complete video signal is 1 V_{p-p} if loaded with 75 Ω. If not select another value for R19 (12 kΩ —27 kΩ)

* set-up can be added

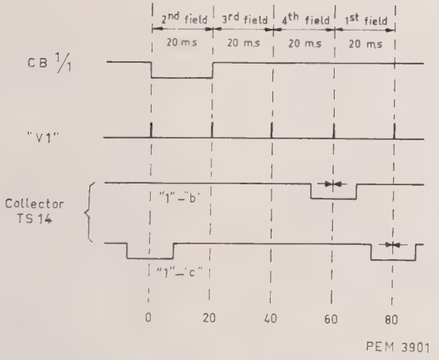


Fig. XVI-1 Pulse diagram, 12.5 Hz pulse position

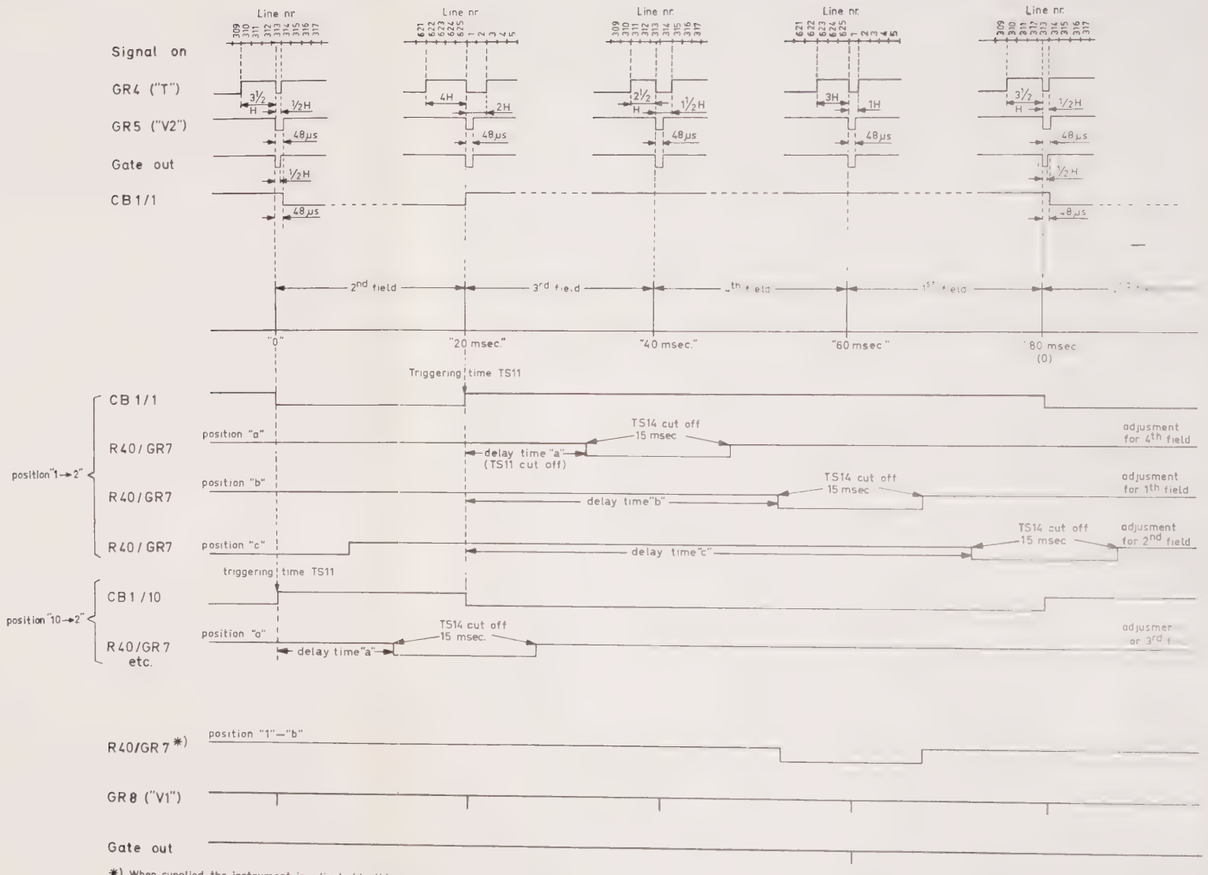
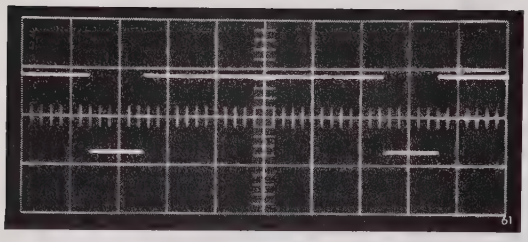
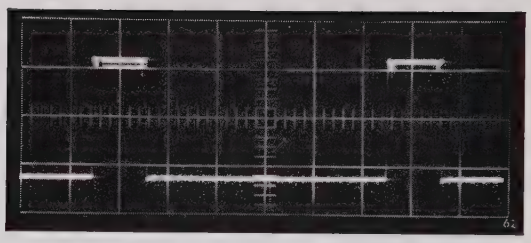


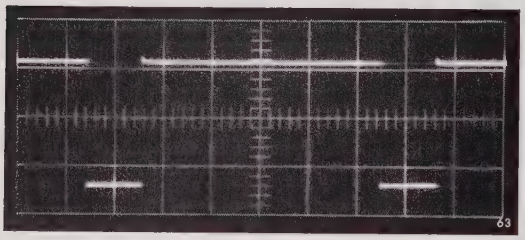
Fig. XVI-2 Pulse diagram, 12½ Hz identification pulses



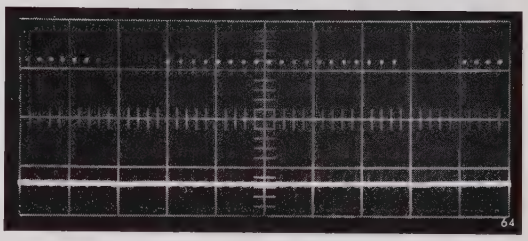
61. 2 V/cm 10 µs/cm



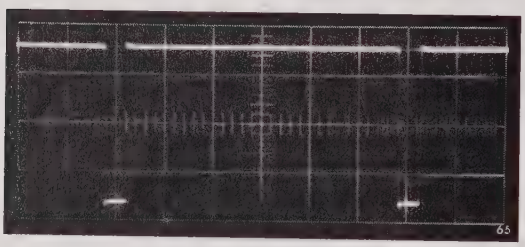
62. 2 V/cm 10 µs/cm



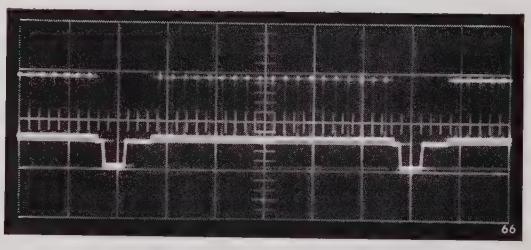
63. 2 V/cm 10 µs/cm



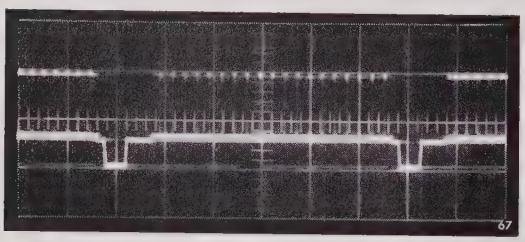
64. 2 V/cm 10 µs/cm



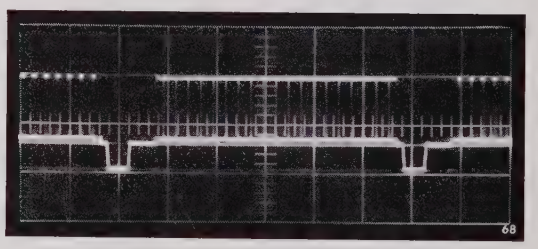
65. 2 V/cm 10 µs/cm



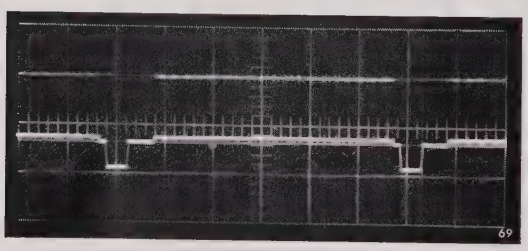
66. 1 V/cm 10 µs/cm



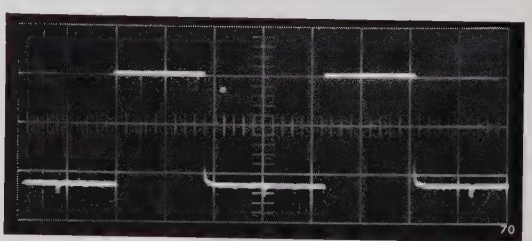
67. 7 V/cm 10 µs/cm



68. 1 V/cm 10 µs/cm



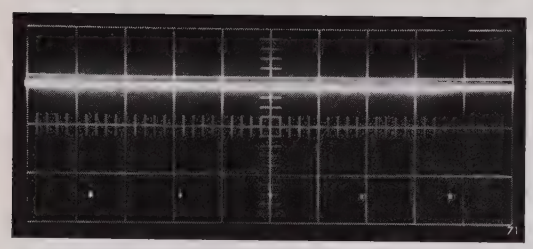
69. 1 V/cm 10 µs/cm



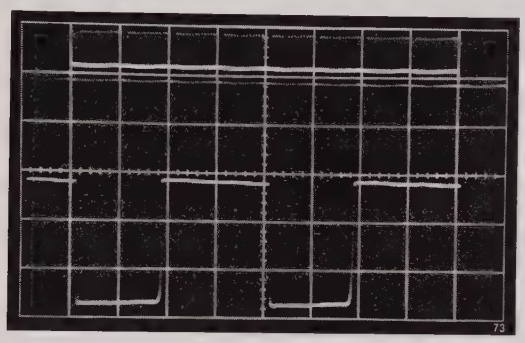
70. 2 V/cm 0.4 ms/cm

Fig. XVI-3 Oscillograms, unit 10

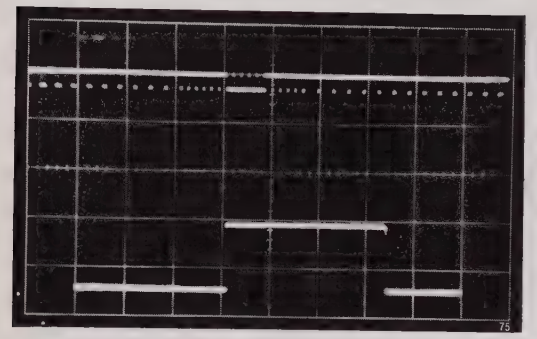
Note: oscillograms 66...69 show set-up, upon delivery there is no set-up.



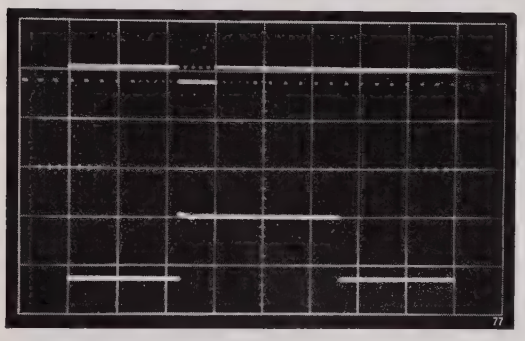
71. 2 V/cm 10 ms/cm



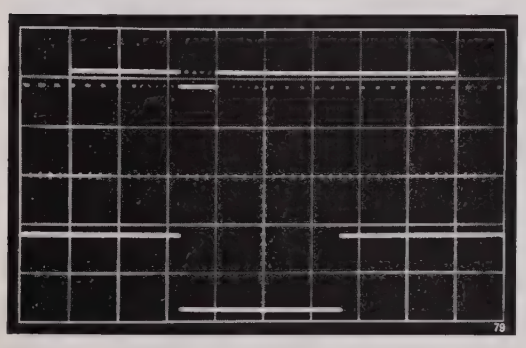
73. 2 V/cm 20 ms/cm
reference: "VIDEO I OUT"

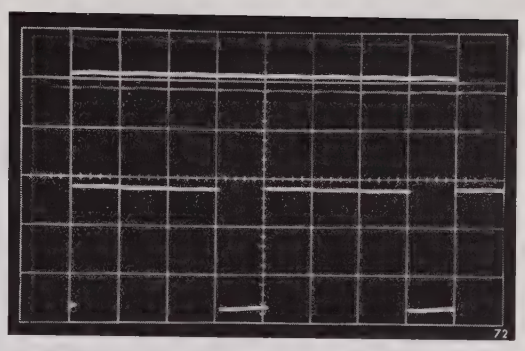


75. 0.5 V/cm 0.2 ms/cm
reference: "VIDEO I OUT"

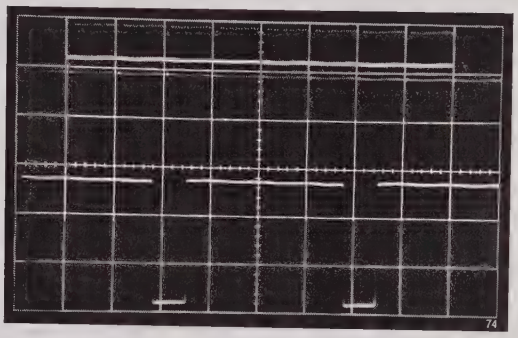


77. 0.5 V/cm 0.2 ms/cm
reference: "VIDEO I OUT"

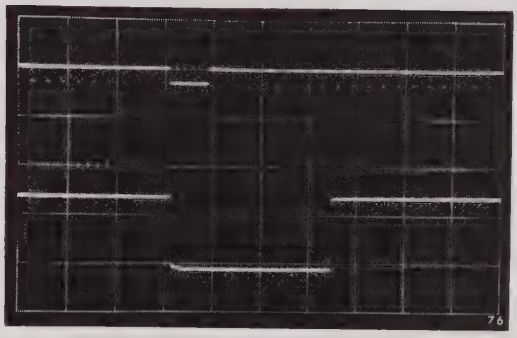




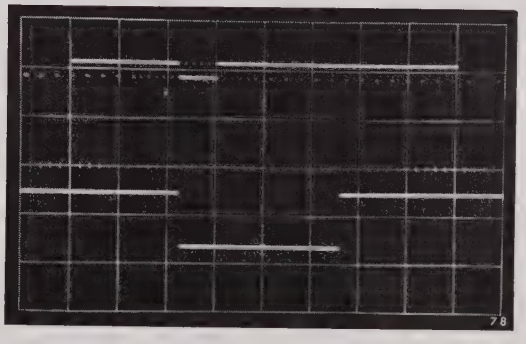
72. 2 V/cm 20 ms/cm
reference: "VIDEO I OUT"



74. 2 V/cm 20 ms/cm
reference: "VIDEO I OUT"



76. 0.5 V/cm 0.2 ms/cm
reference: "VIDEO I OUT"



78. 5 V/cm 0.2 ms/cm
reference: "VIDEO I OUT"

79. 5 V/cm 0.2 µs/cm
reference: "VIDEO I OUT"

Fig. XVI-3 Oscillograms, unit 10

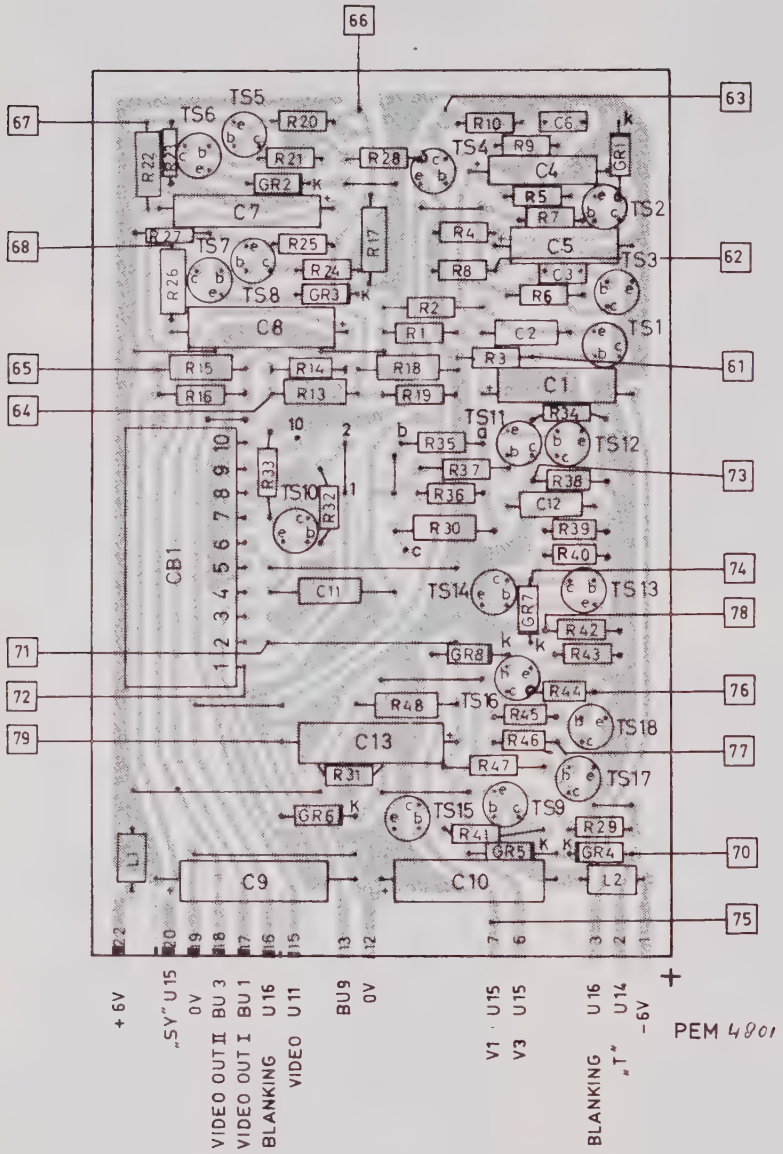


Fig. XVI-4 Printed wiring board, output video, unit 10

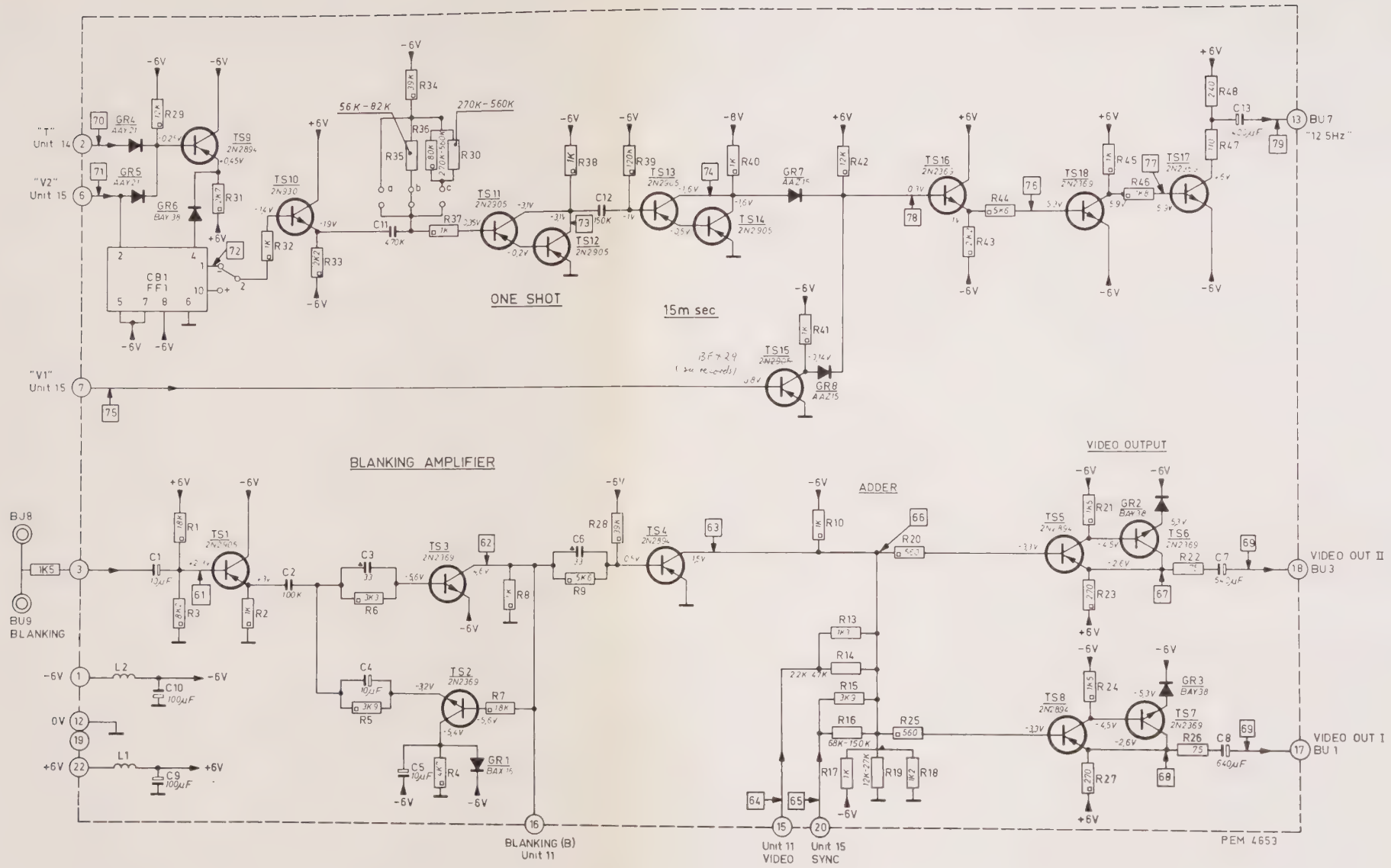


Fig. XVI-5 Circuit diagram, video output, unit 10

XVII Unit 11

Video generator
(Part of PM 5558)

This unit contains the oscillator for vertical pattern information as well as a gate circuit in which the vertical and horizontal informations are combined to produce the desired patterns.

Oscillator TS1-TS2 is operating at approx. 750 kHz. As the oscillator should produce its information each line on the same position, it is synchronized with the line frequency. This is achieved by means of line pulses via one-shot multivibrator CB1, which drives TS3 into saturation. During this time the oscillator is stopped. The start is determined by the width of the output pulse of CB1, which is adjustable by means of R2 "SHIFT VERT-LINES" (front of instrument). The frequency of the oscillator can be changed by selecting another value for R4. The oscillator signal is applied to the 2 : 1 divider TS5-TS6 via inverter TS4. The divider is re-set to the same position at the start of each line by the negative going transient of the line pulse from CB1 via GR13 (see Fig. XVII-1).

The output pulses of the divider are applied to gate-amplifier TS8-TS9 via the differentiating circuits C13/R23 and C14/R25 respectively. The negative output pulses "D1" of TS8 are applied to and-gate GR3...GR6 (the "dots"-gate) while the output pulses "L1" of TS9 are applied to and-gate GR7...GR9 (the vert. lines"-gate). The negative-going output pulses "D1" of TS8, the neg. going blanking pulses "bl" (from unit 10) and the neg. going pulses "D2" (from unit 12) are combined in and-gate GR3...GR6, if via terminal 13 a level of —6 V is applied by means of switch "DOTS" (SK6).

The output pulses of this gate contain the "dot" information. The neg. going output pulses "L1" of TS9 and the blanking pulses are combined in and-gate GR7...GR9. The output pulses of this gate produce the "vertical lines" information, if via terminal 14 a level of —6 V is applied by means of switch "LINES" (SK5).

In and-gate GR10...GR12 the blanking pulses "bl" and the neg. going pulses "L2" (from unit 12) are combined. The output pulses of this gate produce the "horizontal lines" information, if via terminal 14 the level of —6 V is applied. By means of SK5 "LINES", the pulses from. gates GR7...GR9 and GR10...GR12 are selected to give the "Cross-hatch" pattern. By means of SK6 "DOTS" the pulses from gate GR3...GR6 are selected to give the "Dots" pattern. See fig. XVII-2.

Via inverters TS10...TS12 the pulses from the three gates are applied to TS13 where they are mixed. The complete signal is applied to terminal 15 via the push-pull stage TS14-TS15.

Checking and adjusting

Measuring equipment:

Oscilloscope:	e.g. PHILIPS PM 3330
with dual-trace Y amplifier	e.g. PHILIPS PM 3342

Oscillator frequency for horizontal pattern information

Connect the A amplifier of oscilloscope to BU1 "VIDEO I OUT", and B amplifier to connection 15. Depress SK5 ("LINES"). Screwdriver control R2, "SHIFT VERT. LINES", in its centre position.

There should be 19 vertical "white lines" in each line in between the blanking. (See Fig. XVII-2).

If not, select R4 (8.2 kΩ - 19 kΩ).

Screwdriver control R1, "SHIFT HOR LINES", in its centre position. Ther should be 14 horizontal "white lines" in each field in between the blanking.

Depress SK6 ("DOTS").

There should be 20 dots in each line in between the blanking (see Fig. XVII-2).

There should be 15 dots in each field in between the blanking.

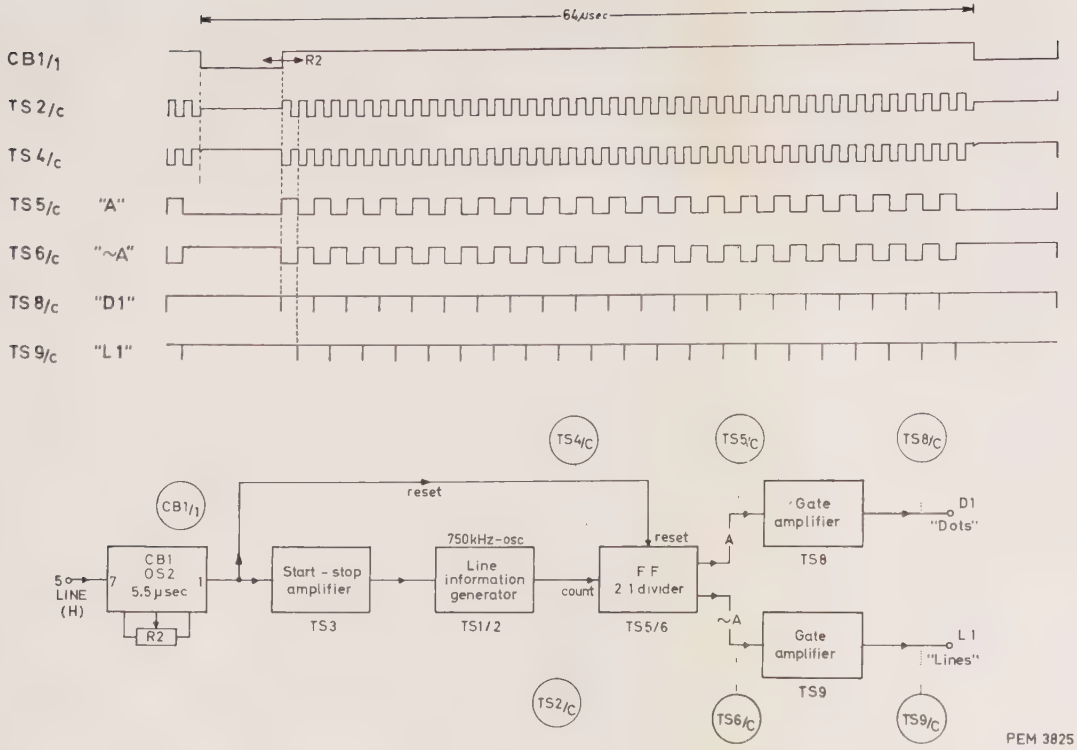


Fig. XVII-1 Pulse diagram, information pulses for dots and vertical lines.

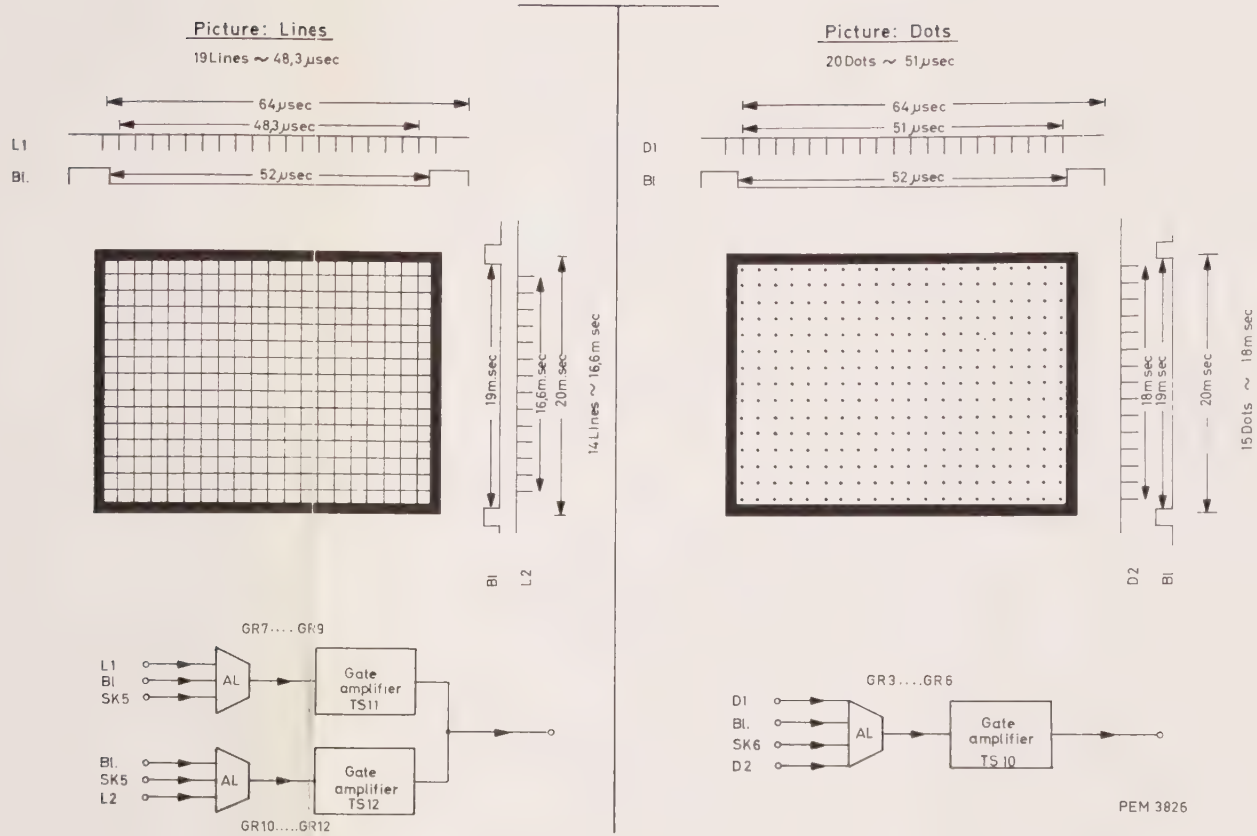
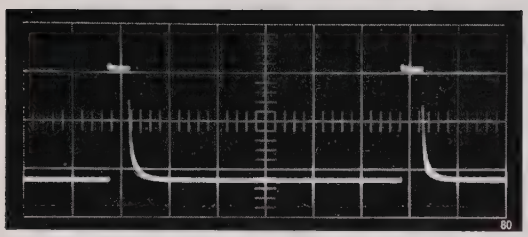
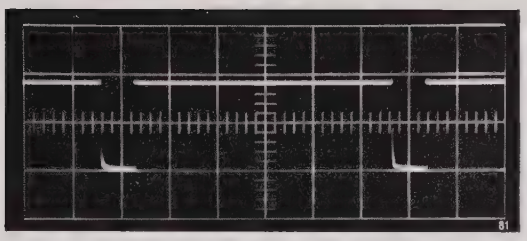


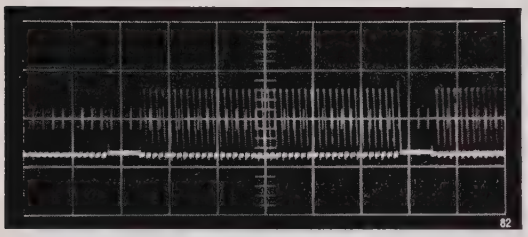
Fig. XVII-2 Pulse diagram, information for dots and cross-hatch



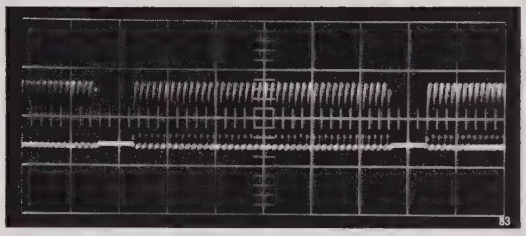
80. 2 V/cm 10 μs/cm



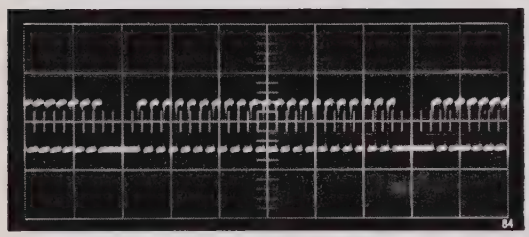
81. 2 V/cm 10 μs/cm



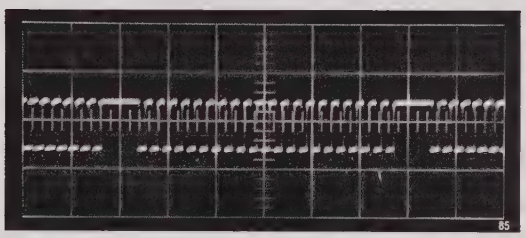
82. 0.5 V/cm 10 μs/cm



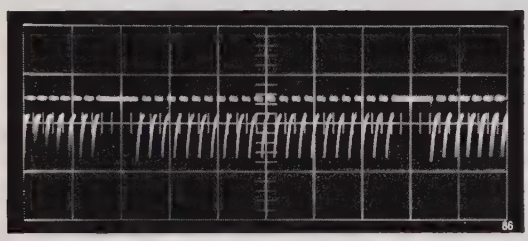
83. 0.5 V/cm 10 μs/cm



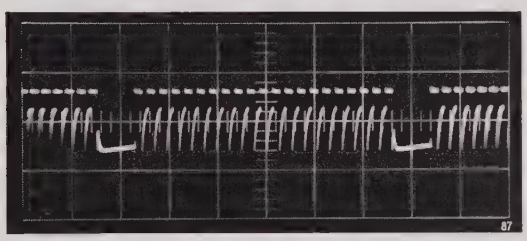
84. 5 V/cm 10 μs/cm



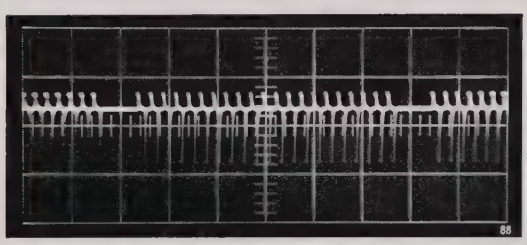
85. 5 V/cm 10 μs/cm



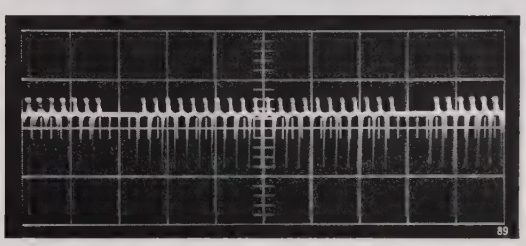
86. 2 V/cm 10 μs/cm



87. 2 V/cm 10 μs/cm

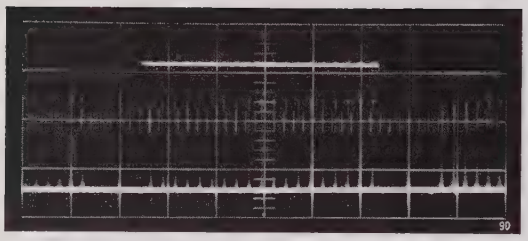


88. 2 V/cm 10 μs/cm

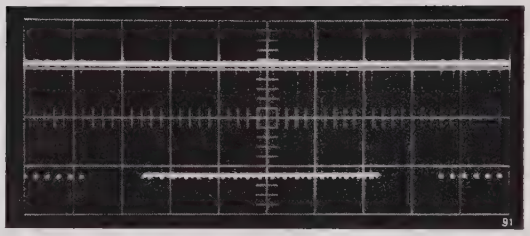


89. 2 V/cm 10 μs/cm

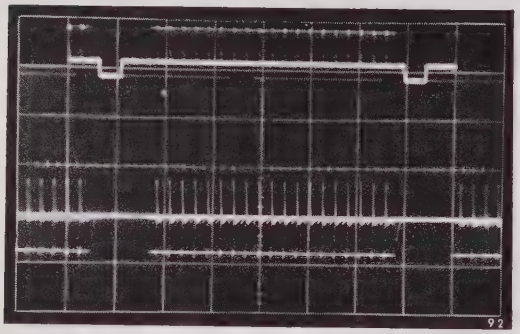
Fig. XVII-3 Oscillograms, unit 11



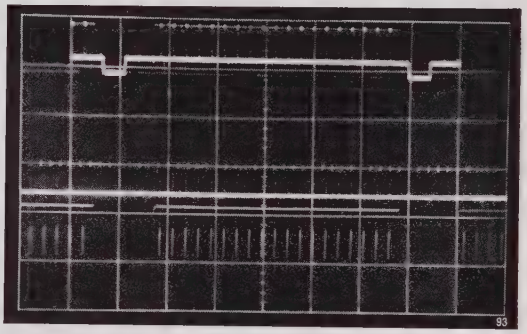
90. 2 V/cm 10 µs/cm



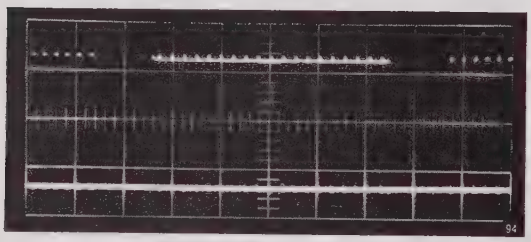
91. 2 V/cm 10 µs/cm



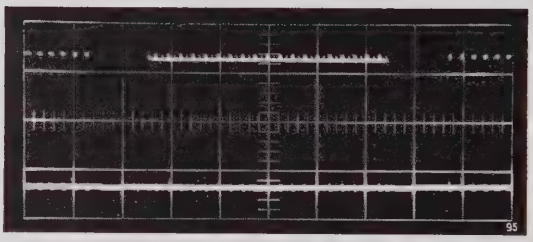
92. 0.5 V/cm 10 µs/cm
reference: "VIDEO I OUT"



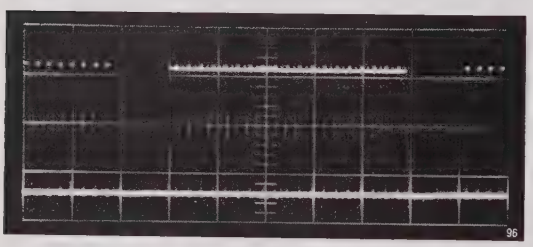
93. 2 V/cm 10 µs/cm
reference: "VIDEO I OUT"



94. 2 V/cm 10 µs/cm



95. 2 V/cm 10 µs/cm



96. 2 V/cm 10 µs/cm

Fig. XVII-3 Oscillograms, unit 11

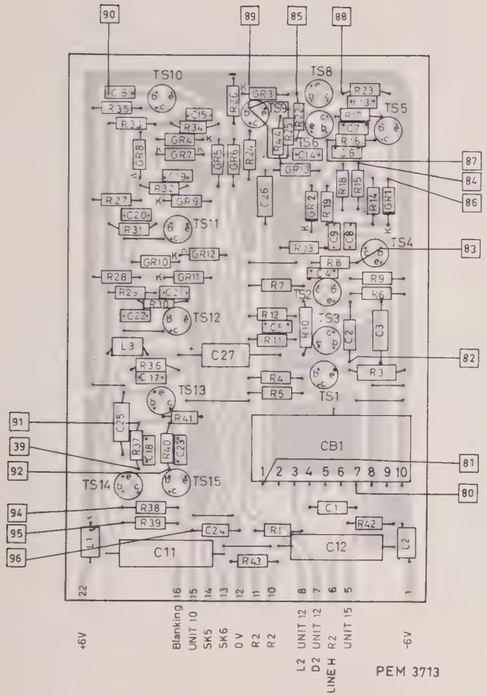


Fig. XVII-4 Printed wiring board, video generator, unit 11

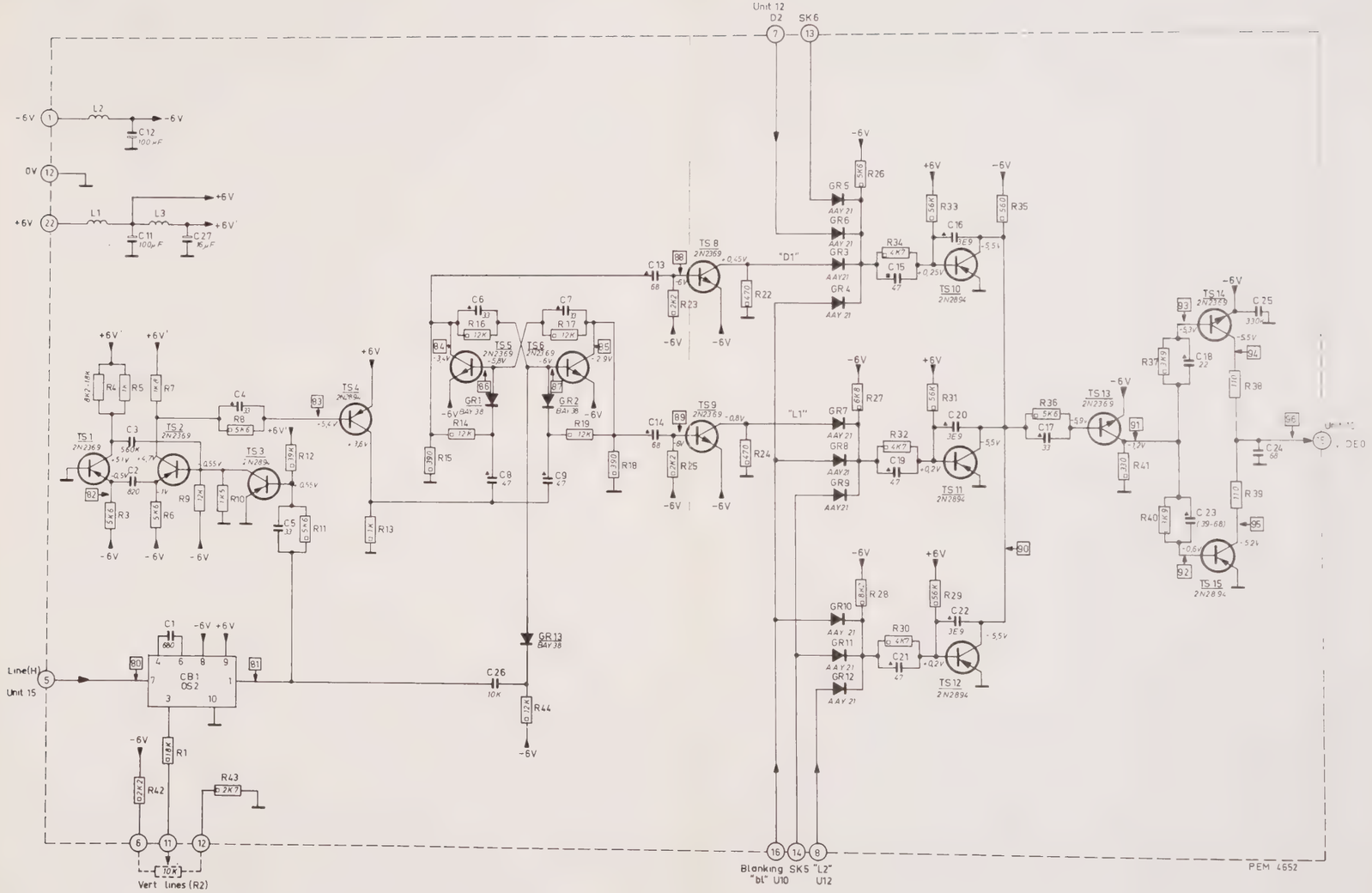


Fig. XVII-5 Circuit diagram, video generator, unit 11

XVIII Unit 12

Horizontal line divider
(Part of PM 5558)

The pulses generated in this unit are used to produce the horizontal lines and dots in the patterns.
The pulses are produced in the 20 : 1 divider CB2 and CB5...CB8. This divider is controlled by the line pulses "H" via GR4 and by the frame pulses, which are derived from "V2", via GR3. By means of feedback from CB7 to CB5 and CB6, these dividers are operating as 5 : 1 dividers, while CB8 operates as a 2:1 divider (see pulse diagrams Fig. XVIII-1).

The line pulses "H" on CB2 serve as counting pulses, which cause (via the 20 : 1 divider) CB3 and CB4 to supply only one pulse after each 20 line pulses.
The generated pulses "L2" which produce the horizontal lines in the pattern, are applied to and-gate GR10... GR12 in unit 11. The generated pulses "D2", which together with the "D1" pulses in unit 11 produce the dots in the pattern, are applied to and-gate GR3...GR6 in unit 11. The pulses from GR3 serve as setting and stop pulses for the divider so that this divider is stopped during these pulses. The stop pulses are obtained from the frame pulses "V2" in gate generator TS1-TS2, pulse shaper CB1 and amplifier TS3. The pulse width is determined by the discharging time of C1 through TS1 and is adjustable by means of R1 "SHIFT HOR. LINES" (front of instrument). TS2 is a one-shot circuit. R1 controls the shift of the horizontal lines and the dots in the verical direction.

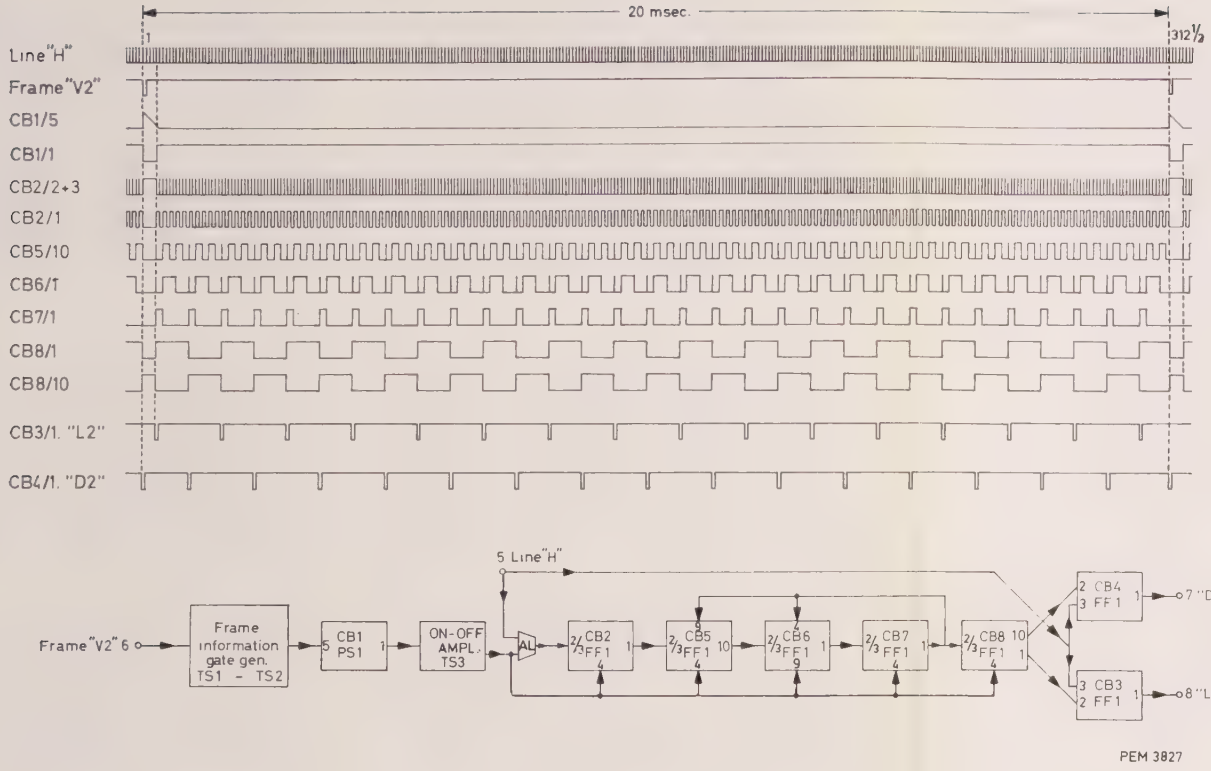
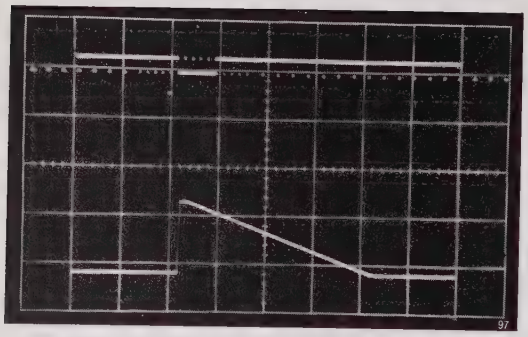
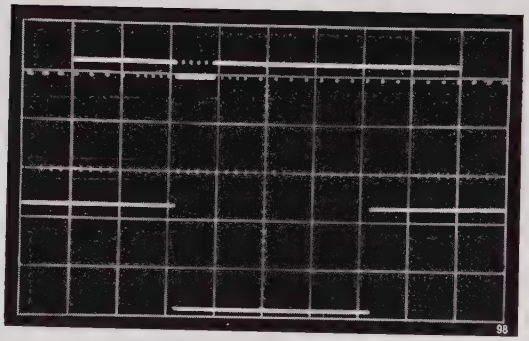


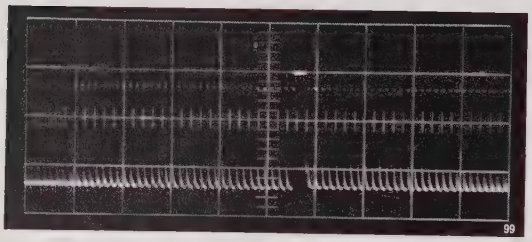
Fig. XVIII-1 Pulse diagram, information pulses for dots and vertical lines



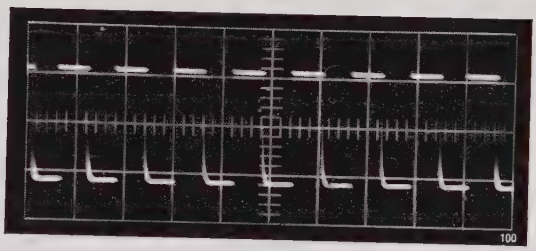
97. 5 V/cm 0.2 ms/cm
reference: "VIDEO I OUT"



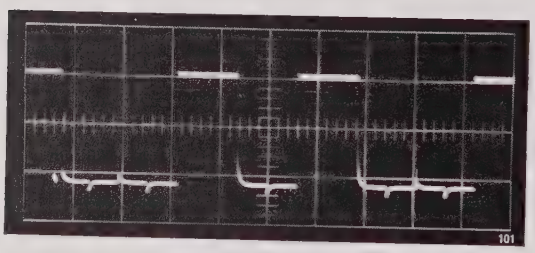
98. 2 V/cm 0.2 ms/cm
reference: "VIDEO I OUT"



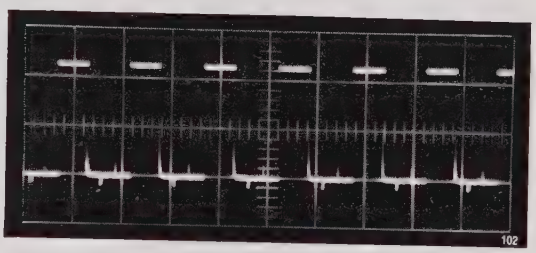
99. 2 V/cm 0.4 ms/cm



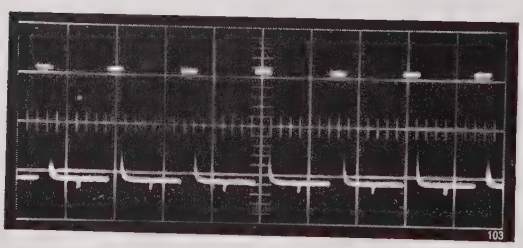
100. 2 V/cm 0.1 ms/cm



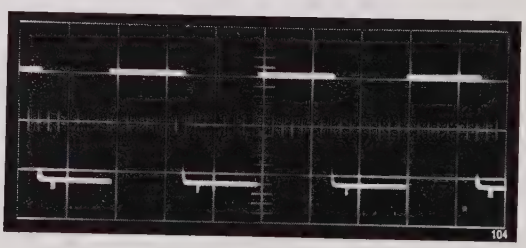
101. 2 V/cm 0.1 ms/cm



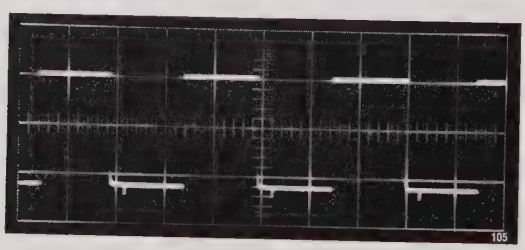
102. 2 V/cm 0.4 ms/cm



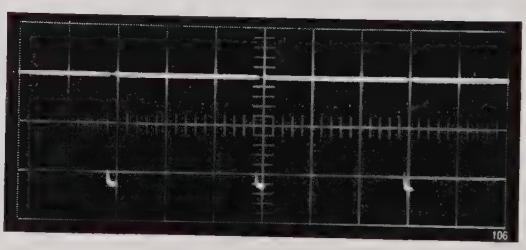
103. 2 V/cm 0.4 ms/cm



104. 2 V/cm 0.4 ms/cm



105. 2 V/cm 0.4 ms/cm



106. 2 V/cm 0.4 ms/cm

Fig. XVIII-2 Oscillograms, unit 12

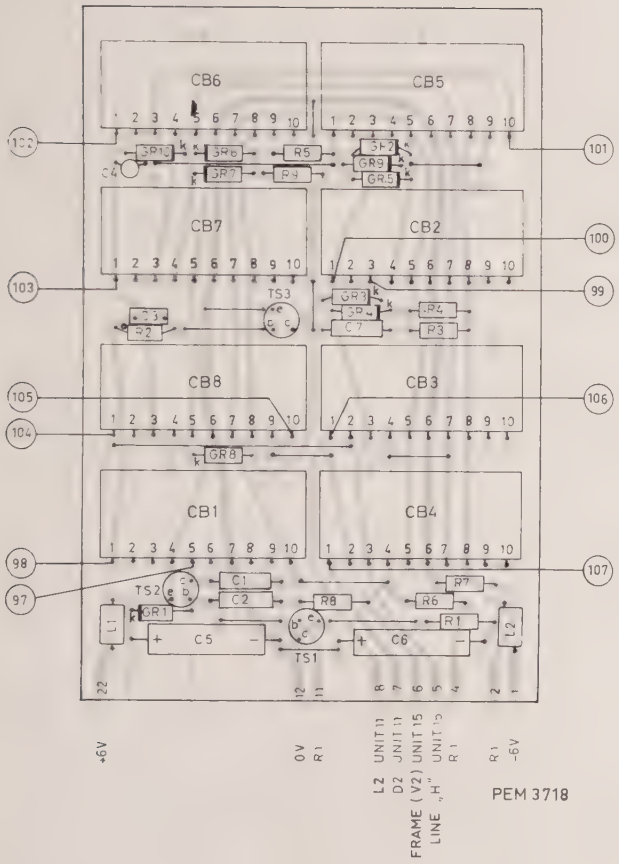
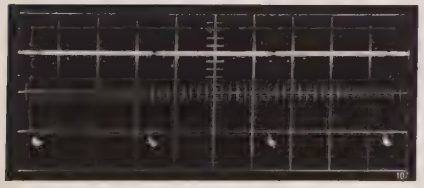


Fig. XVIII-3 Printed wiring board, horizontal-line divider, unit 12



107. 2 V/cm 0.4 ms/cm

Fig. XVIII-2 Oscillograms, unit 12

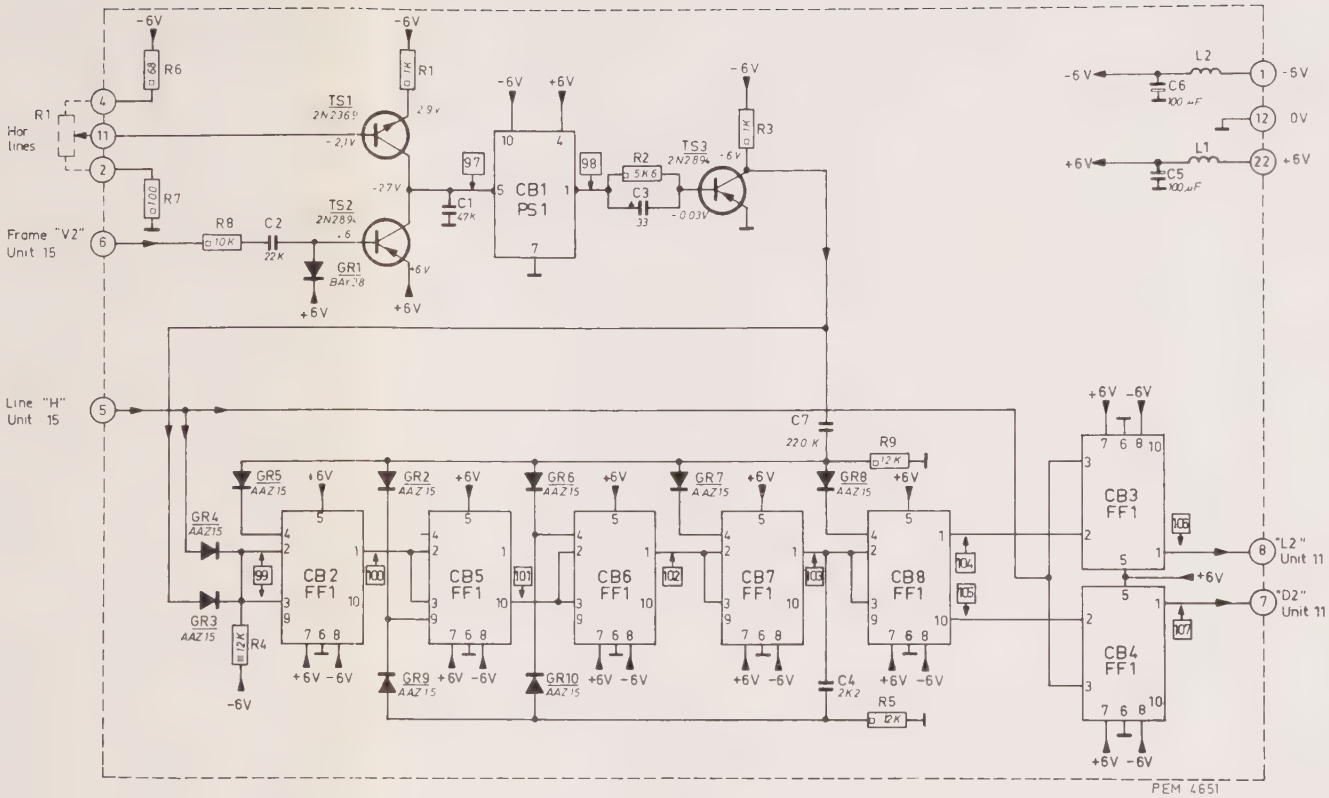


Fig. XVIII-4 Circuit diagram, horizontal-line divider, unit 12

XIX Unit 13 and 14

Burst-keying generator
308 : 1 divider

The burst-keying generator can be divided into two parts:

1. The pulse generator supplying a keying pulse which can be used for burst generation in an encoder.
2. The suppression circuit for suppressing the burst-keying pulse during field blanking.

The burst-keying pulse is generated by the one-shot multivibrators CB1 and CB2 in unit 13.
The position of this pulse is determined by CB1. This multivibrator is triggered by the leading edge of the line pulse at terminal 5 while CB2 is triggered by the trailing edge of the output pulse of CB1 (approx. 5.6 µs).
The output pulse of CB2 (approx. 2.2 µs.) is used as burst-keying pulse (see oscillograms 108 and 109 in Fig. XIX-1).
The position of this pulse is adjustable by means of R3 "BURST POS." or via switch SK8 "NOM" (front of instrument) determined by R15/R16 (5.6 µs).
Resistors R2 and R14 are selected so that they ensure the correct pulse time for the output pulses of CB1 and CB2 respectively. The burst-keying pulse is applied to BU10 "BURST KEY" via push-pull amplifier TS2-TS4.

The burst-keying suppression is obtained by driving TS1 into saturation so that the burst-keying signal to TS2 is short circuited. The control voltage of TS1 is obtained from burst-keying suppression circuit CB3... CB6 in unit 13 and CB1...CB8 in unit 14 and CB3 in unit 15.
With the PAL system, the first and the last burst of each field is transmitted as a positive one (burst phase = 135°). As the interlacing displaces the burst position $\frac{1}{2}$ a line per field (Fig. XIX-1), the burst-keying suppression in four successive fields should be located as shown in Fig. XIX-2. This "moving" burst-suppression is obtained by controlling flip-flop CB6 in unit 13 with pulses from the divider CB1...CB8 in unit 14 and from the divider CB3...CB5 in unit 13. The output pulse of divider CB1...CB8 in unit 14 determines the start of the burst suppression (drives, via CB6, TS1 into saturation), while the output pulse of divider CB3... CB5 stops the burst suppression (drives, via CB6, TS1 into cut-off). The controlling pulses for both dividers ("$\frac{1}{2}$ H" and "$\sim \frac{1}{2}$ H") are supplied by the 2 : 1 divider CB3 in unit 15.
Divider CB1...CB8 in unit 14 consists of the 2 : 1 divider CB1, the 7 : 1 divider CB2...CB4, and the 11 : 1 divider CB5...CB8.

Therefore a total division of 308 : 1 of the line frequency is obtained (see pulse diagram Fig. XIX-3).
The dividers are reset at field start "t1" by the "V3" pulse (via both diodes GR1) so that they start in the same phase each time. The 7 : 1 dividing in unit 14 is obtained by feedback from CB4 to the d.c. input of CB2 via GR3. The 11 : 1 divider CB5...CB8 in unit 14 actually is a binary counter but operates as an 11 : 1 divider because it is reset to "1-1-0-1" by means of the "V3" pulses supplied to d.c. inputs 9, 9, 4 and 9 of CB5... CB8 respectively. After CB5 has been supplied with 11 pulses, CB8 will change its state from "0" to "1" at the 12th pulse.
The moment that CB8 changes its state from "0" to "1" is the starting moment (t2) of the burst-suppression. (see pulse diagram Fig. XIX-3). As the pulses "$\frac{1}{2}$ H" are due to the interlacing phase-shifting half a line each field, the starting moment (t1) of the divider will also be displaced half a line and a complete cycle will in fact consists of 4 fields. Therefore the starting moment (t2) of the burst-suppression will "move" in a cyclus of four fields. (see pulse diagram Fig. XIX-4).
The divider system which determines the stopping moment (t3) of the burst suppression consists of the two binary dividers CB3, CB4 and the flip-flop CB5 (unit 13).

The divider is controlled via gate GR2-GR3 so that the pulses "$\sim \frac{1}{2}$ H" are only reaching CB3 if the output pulses of CB5 are "0". As is shown in the pulse diagram Fig. XIX-5 the functioning of the divider is as follows:

1. At moment "t1", CB3 is set to zero by the leading edge of the "V3" pulse (15 µs.).
2. At moment "t4", CB5 is set to zero by the trailing edge of the "V2" pulse (48 µs.).
3. Gate GR2-GR3 is then, because of the action in point 2, "open" for the "$\sim \frac{1}{2}$ H" pulse and passes it on to CB3/2 + 3.
4. At moment "t3", CB5 will change its state from "0" to "1" due to the trailing edge of the output pulse of CB4 so that CB6 changes its state from "0" to "1".

The moment that CB6 changes its state from "0" to "1" is the stopping moment (t3) of the burst-suppression.

At the beginning of each field, after CB3/4 is triggered by the positive-going transient of field pulse "V3" (moment "t1"), the signal of CB5/1 opens the and-gate GR2-GR3 for the "$\sim \frac{1}{2}$ H" pulses. This is done in every field and because CB5 always changes its state at the 3rd positive-going transient of pulse "$\sim \frac{1}{2}$ H" on CB3/2+3 (moment t4). As the "$\sim \frac{1}{2}$ H" pulses are shifted each field half a line, the stopping moment of the burst suppression (t4) will, so as the starting moment (t2), "move" in a cyclus of four fields. Because the "movements" of t2 and t4 are identical, there will be a "moving" burst-suppression with constant length (9H).

Checking and adjusting

Measuring equipment:

Oscilloscope	e.g. PHILIPS PM 3330
with dual trace Y-amplifier	e.g. PHILIPS PM 3342

Burst-keying pulse

Connect the A amplifier of oscilloscope to connection 13 of unit 13 (burst-key) and B amplifier to connection 5 of unit 13 (line pulse).
Set R3/SK8 "BURST POS." fully counter clockwise (SK8 switched to position "NOM").
The start of the burst-keying pulse should be 5.6 µs. after the front porch of the line synchronizing pulse. If not, select another value for R2 (47 kΩ – 100 kΩ).
The width of the burst-keying pulse should be 2.2 µs. ± 0.1 µs. If not select another value for R14 (39 kΩ – 180 kΩ).

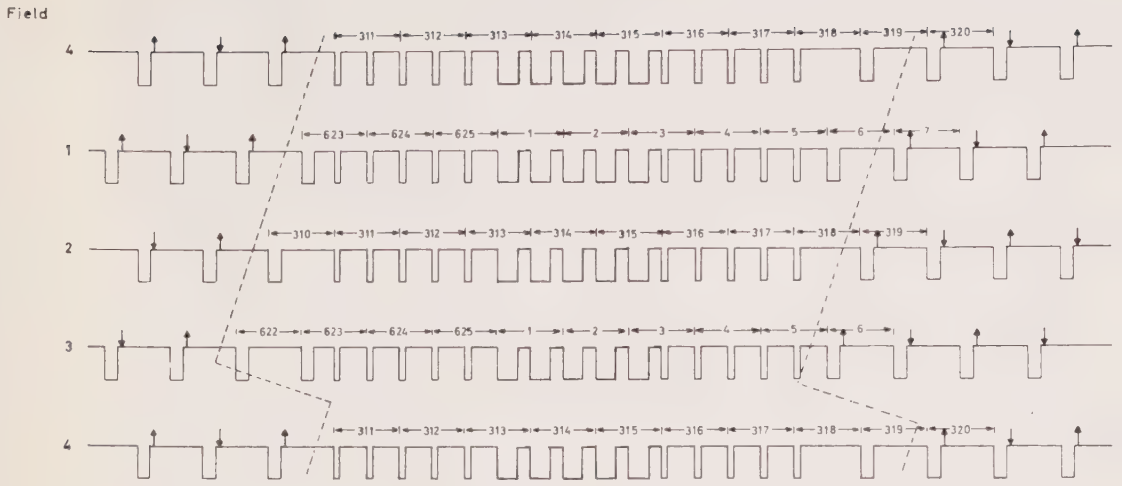


Fig. XIX-1 Pulse diagram, burst position

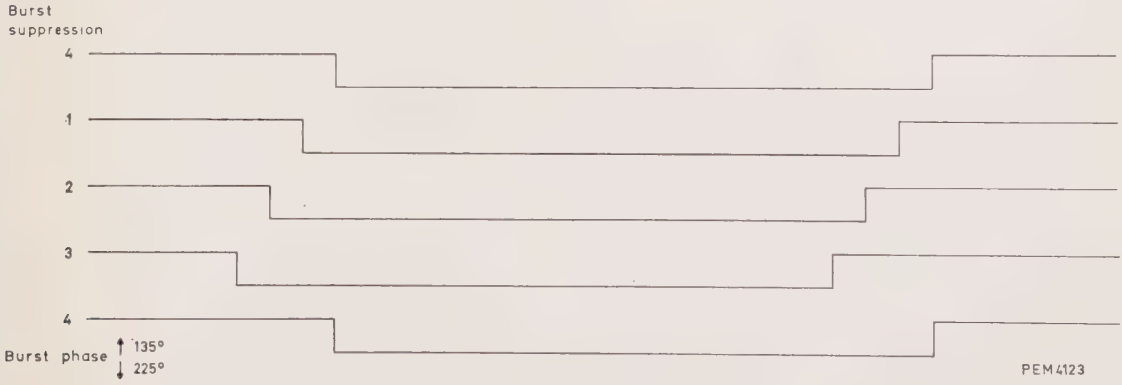


Fig. XIX-2 Pulse diagram, burst suppression

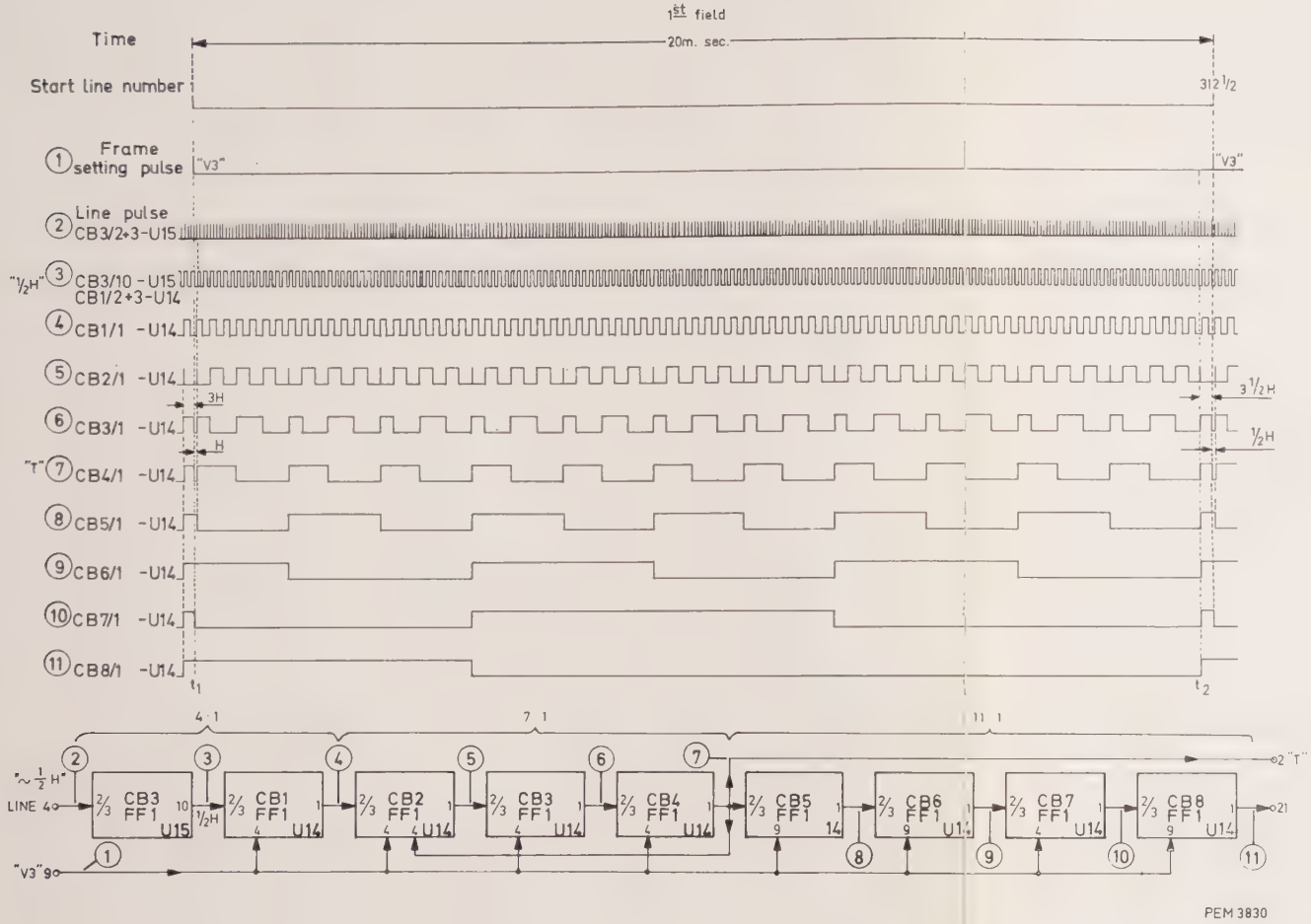


Fig. XIX-3 Pulse diagram, 308 : 1 divider

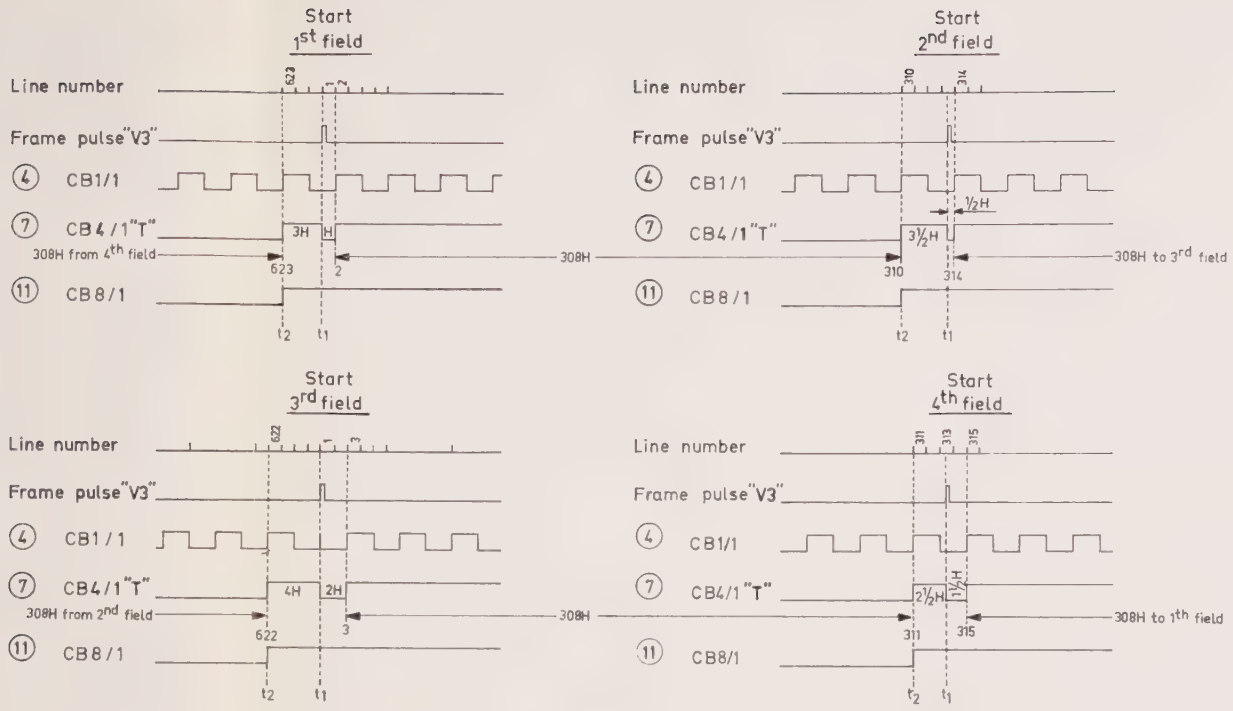


Fig. XIX-4 Pulse diagram, start moment burst suppression

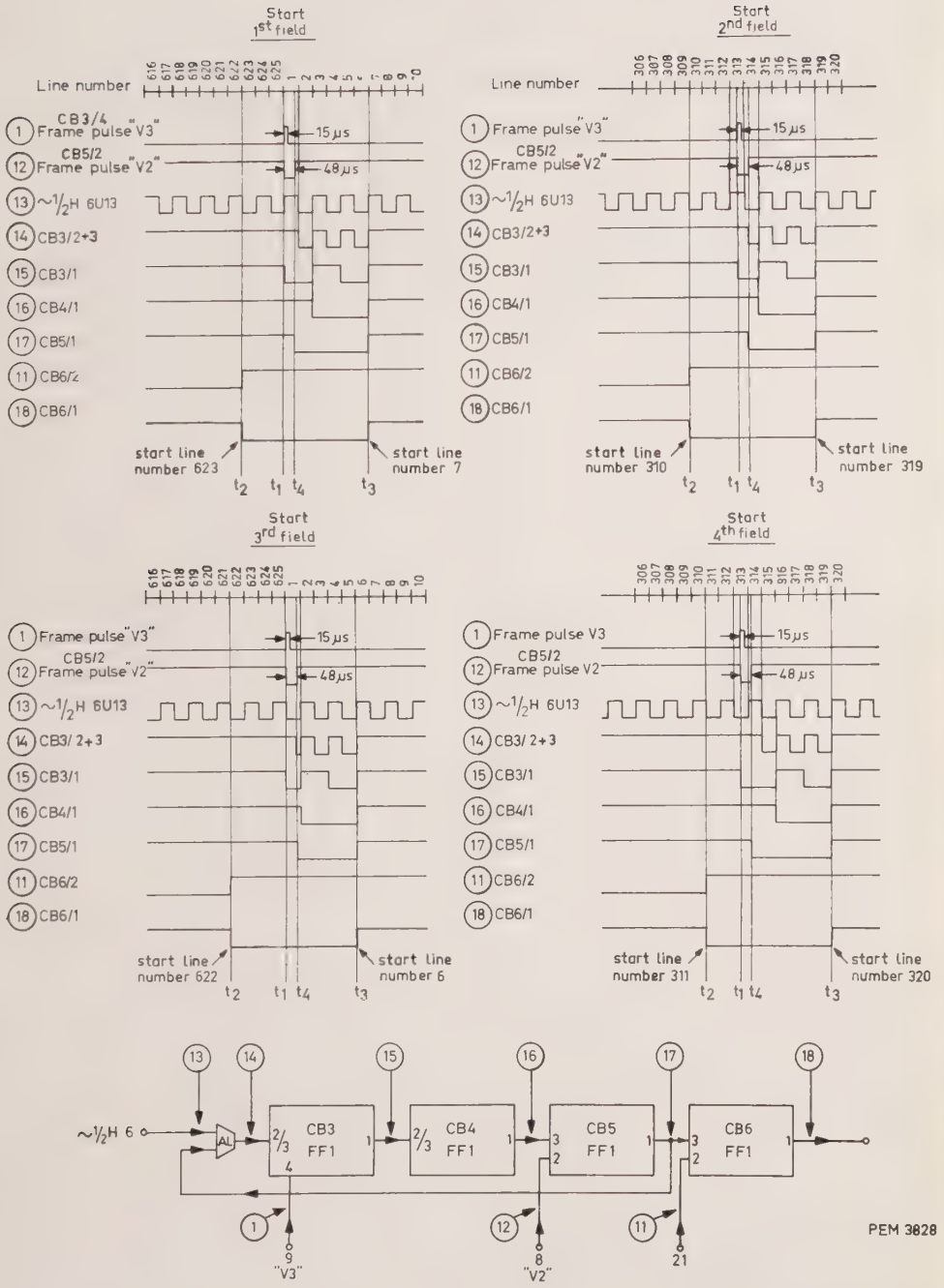
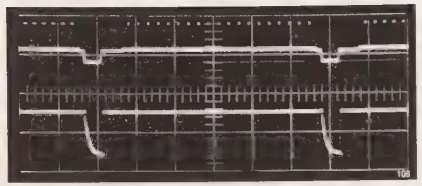
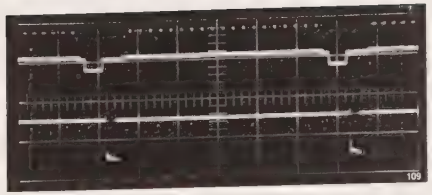


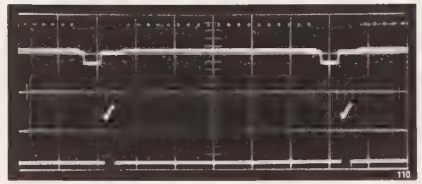
Fig. XIX-5 Pulse diagram, stop moment burst suppression



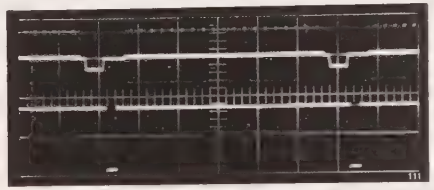
108. 5 V/cm 10 µs/cm
reference: "VIDEO I OUT"



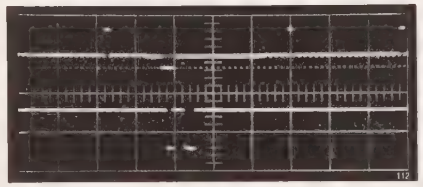
109. 5 V/cm 10 µs/cm
reference: "VIDEO I OUT"



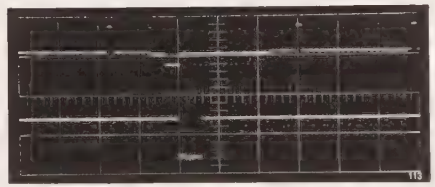
110. 5 V/cm 10 µs/cm
reference: "VIDEO I OUT"



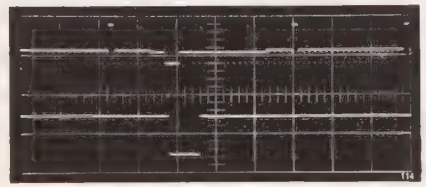
111. 5 V/cm 10 µs/cm
reference: "VIDEO I OUT"



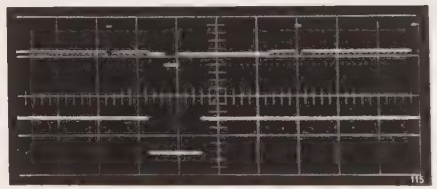
112. 5 V/cm 0.4 ms/cm
reference: "VIDEO I OUT"



113. 5 V/cm 0.4 ms/cm
reference: "VIDEO I OUT"

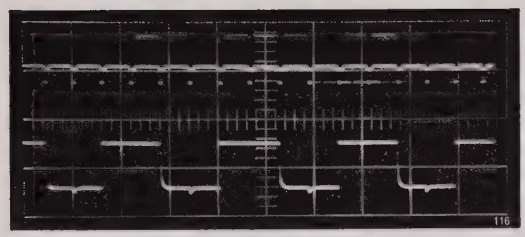


114. 5 V/cm 0.4 ms/cm
reference: "VIDEO I OUT"

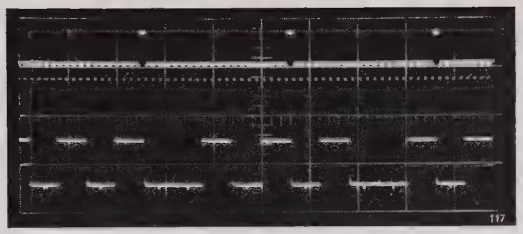


115. 5 V/cm 0.4 ms/cm
reference: "VIDEO I OUT"

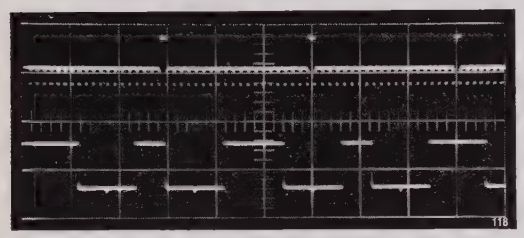
Fig. XIX-6 Oscillograms, units 13 and 14



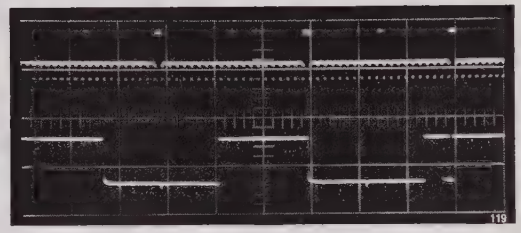
116. 5 V/cm 0.1 ms/cm
reference: "VIDEO I OUT"



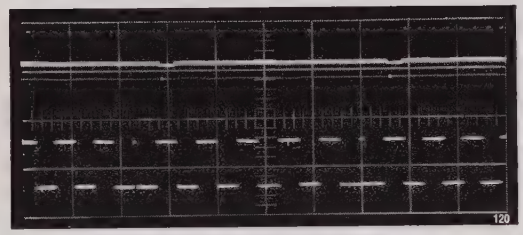
117. 5 V/cm 0.4 ms/cm
reference: "VIDEO I OUT"



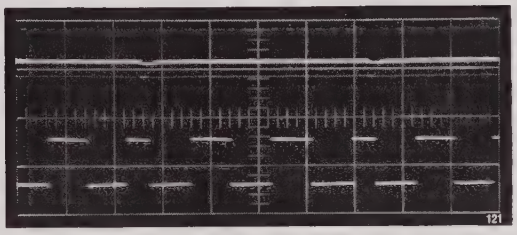
118. 5 V/cm 0.4 ms/cm
reference: "VIDEO I OUT"



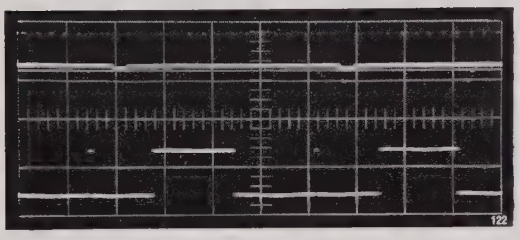
119. 5 V/cm 0.4 ms/cm
reference: "VIDEO I OUT"



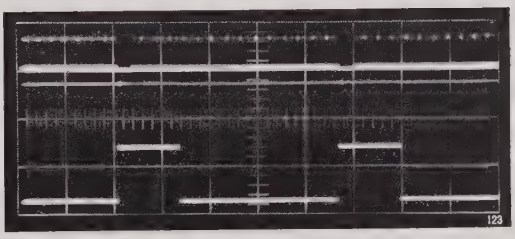
120. 5 V/cm 4 ms/cm
reference: "VIDEO I OUT"



121. 5 V/cm 4 ms/cm
reference: "VIDEO I OUT"



122. 5 V/cm 4 ms/cm
reference: "VIDEO I OUT"



123. 5 V/cm 4 ms/cm
reference: "VIDEO I OUT"

Fig. XIX-6 Oscillograms, units 13 and 14

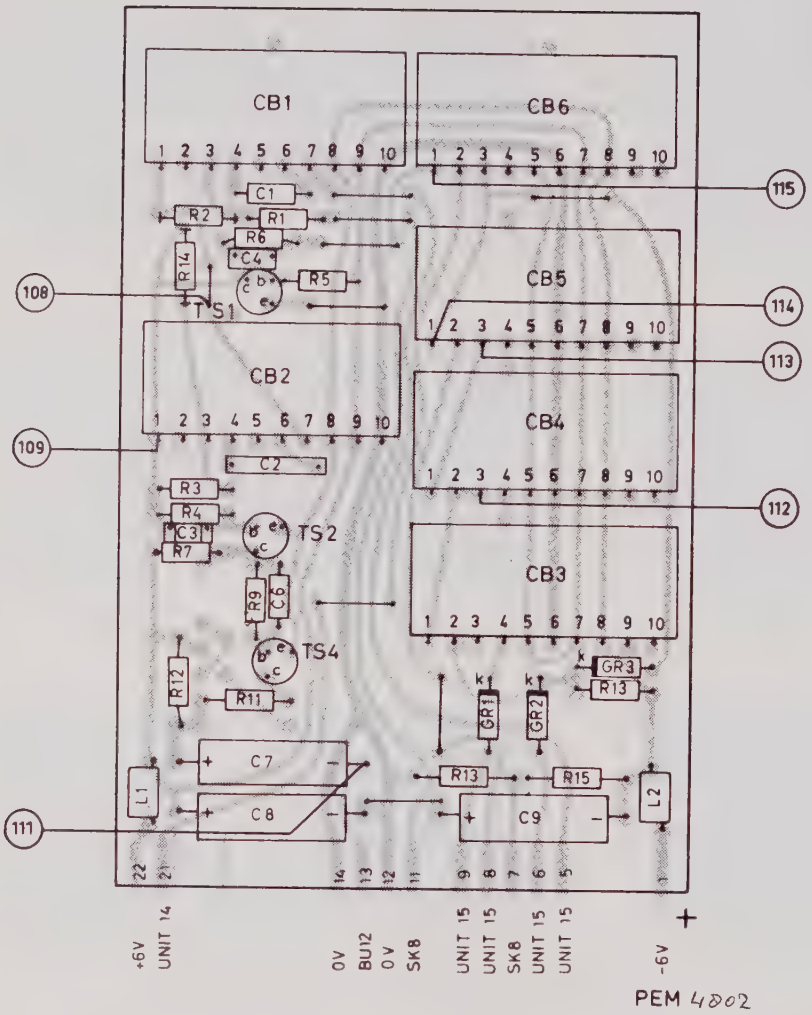


Fig. XIX-7 Printed wiring board, burst pulse generator, unit 13

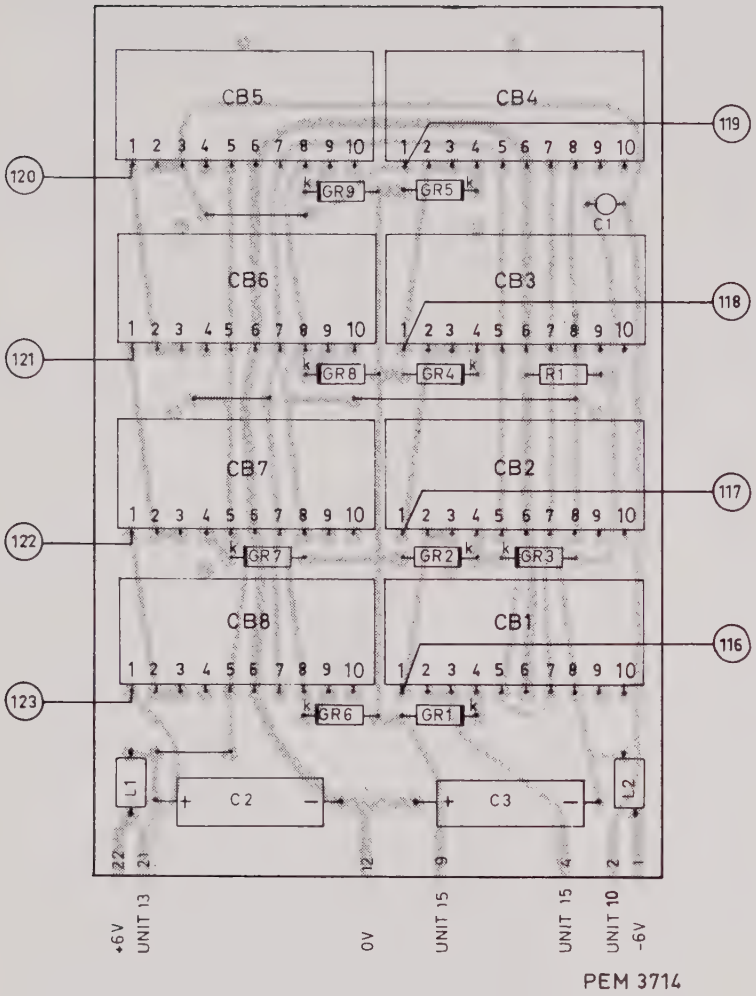


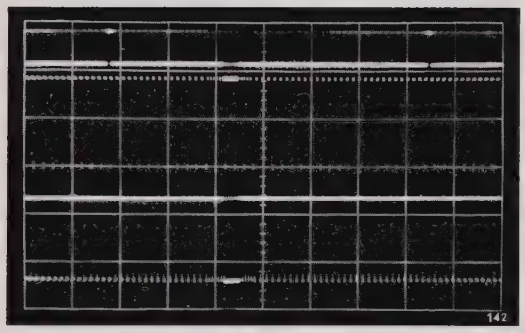
Fig. XIX-8 Printed wiring board, 308 : 1 divider, unit 14

These circuits are controlled by means of a common signal obtained in the AND gate GR11–GR12.
GR11 is supplied with complete sync. signal from TS3 and GR12 with separated frame pulses.
In this way the triggering porch of the controlling pulse (and thus the front porch of V1, V2, V3) is very accurate with respect to the front porch of the applied sync. signal (see fig. XX–5). The frame pulses to GR12 are separated in TS16...TS20.

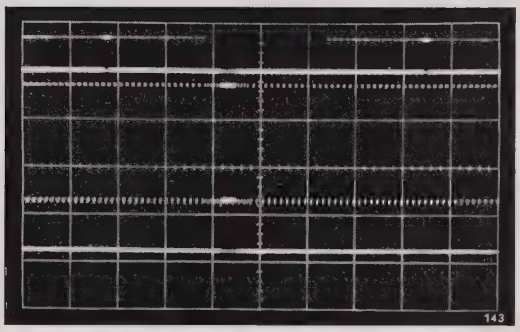
TS16, TS17 form a one-shot oscillator, which is controlled by a negative going pulse diverted from the first pre-equalizing pulse. In order to obtain this pulse the signal from TS3 is first differentiated by means of C15/R40. As shown in fig. XX-6 the R-C time is chosen so that the equalized pulses maintain their back porch, while the differentiated line pulses are "discharged" before their back porch arrives.
GR9 eliminates negative going spikes. After another differentiation (C16/R42) the pulse shown in fig. XX-6 arises, the negative peak of which triggers the one-shot oscillator.

C18/R45 are determinating the width of the generated pulse. From TS17 the frame pulse is fed to GR12 in the AND gate via the inverter TS18 and two one-shot circuits TS19, TS20. The working principle of these circuits is shown in fig. XX-7.

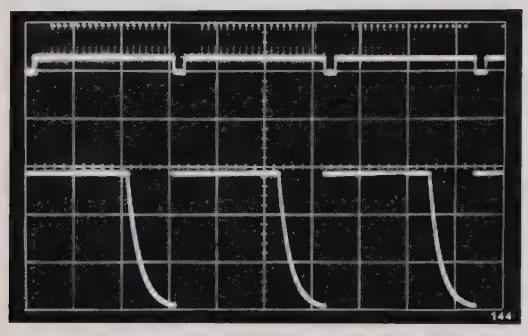
The width of the three frame pulses V1, V2, V3 is 680 µsec., 48 µsec. and 15 µsec. respectively.



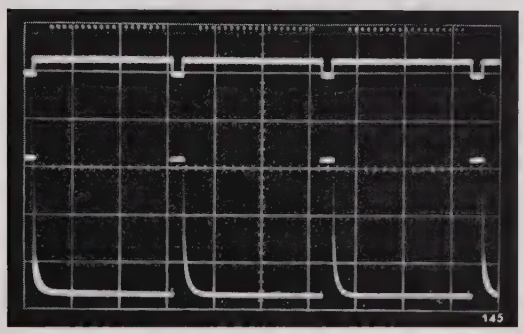
142. 2 V/cm 0.5 ms/cm
reference: "VIDEO I OUT"



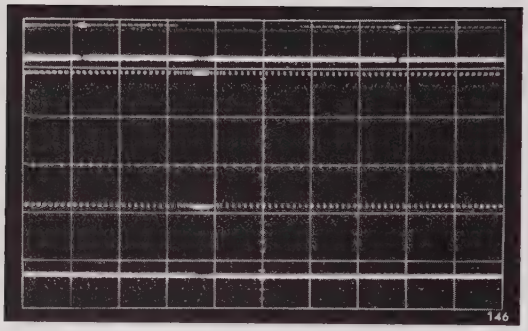
143. 5 V/cm 0.5 ms/cm
reference: "VIDEO I OUT"



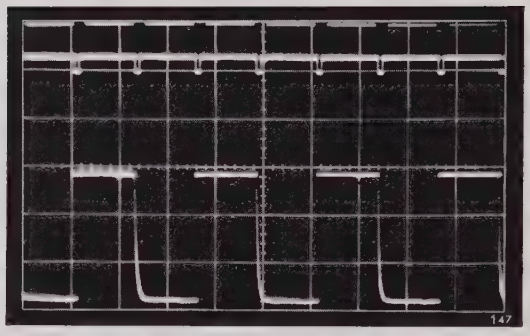
144. 2 V/cm 20 µs/cm
reference: "VIDEO I OUT"



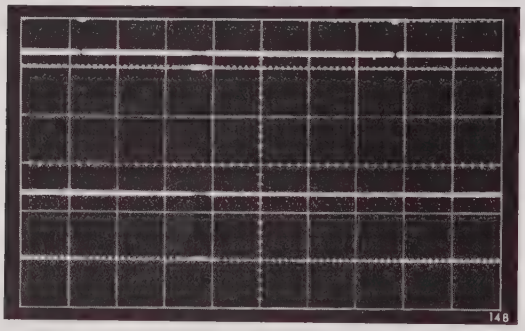
145. 2 V/cm 20 µs/cm
reference: "VIDEO I OUT"



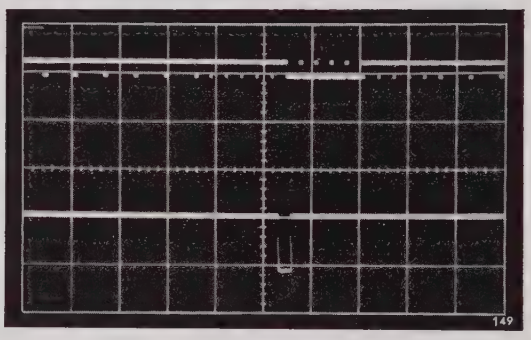
146. 0.5 V/cm 0.5 ms/cm
reference: "VIDEO I OUT"



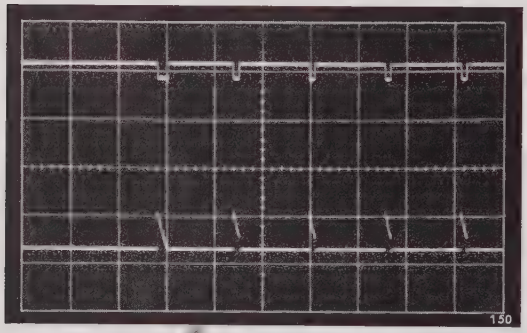
147. 2 V/cm 50 µs/cm
reference: "VIDEO I OUT"



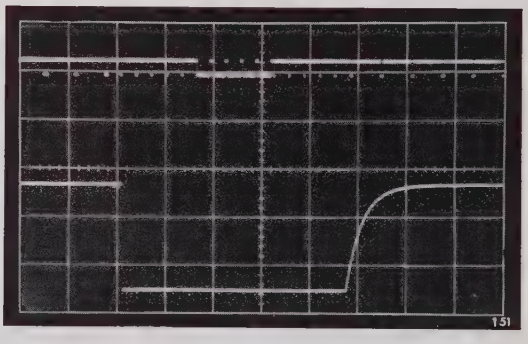
148. 5 V/cm 0.5 ms/cm
reference: "VIDEO I OUT"



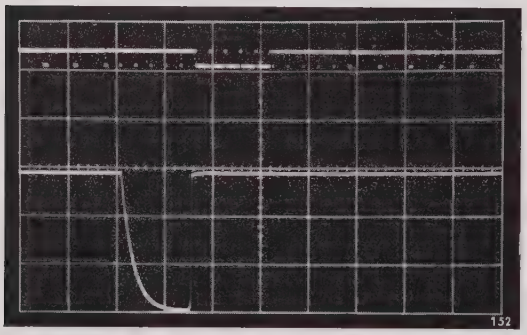
149. 5 V/cm 0.1 ms/cm
reference: "VIDEO I OUT"



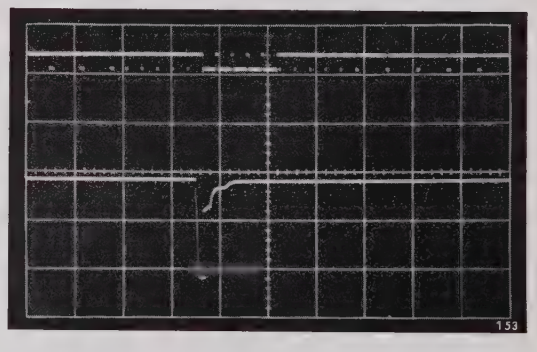
150. 5 V/cm 20 µs/cm
reference: "VIDEO I OUT"



151. 2 V/cm 0.1 ms/cm
reference: "VIDEO I OUT"

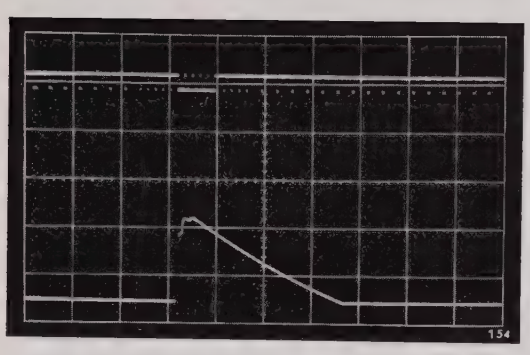


152. 2 V/cm 0.1 ms/cm
reference: "VIDEO I OUT"

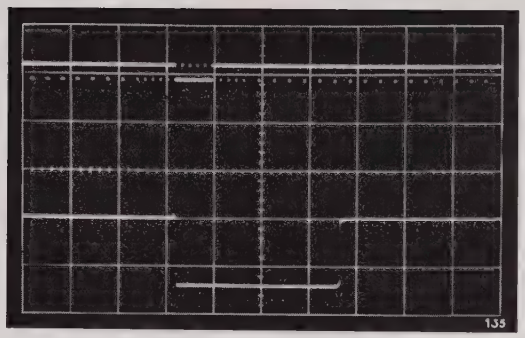


153. 2 V/cm 0.1 ms/cm
reference: "VIDEO I OUT"

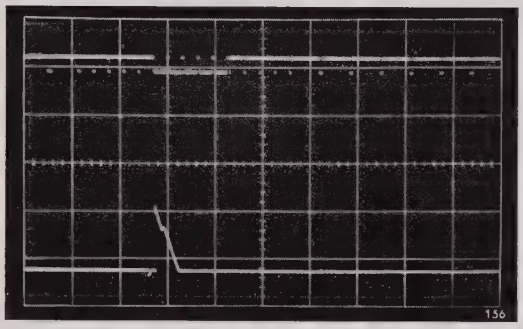
Fig. XX-1 Oscillograms, unit 15



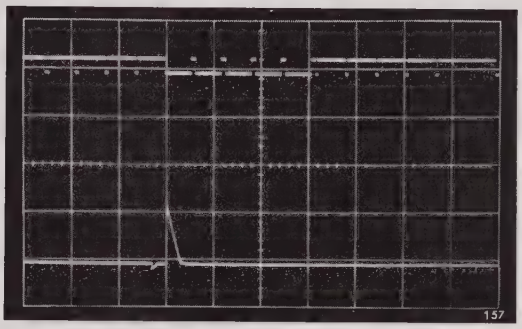
154. 2 V/cm 0.2 ms/cm
reference: "VIDEO I OUT"



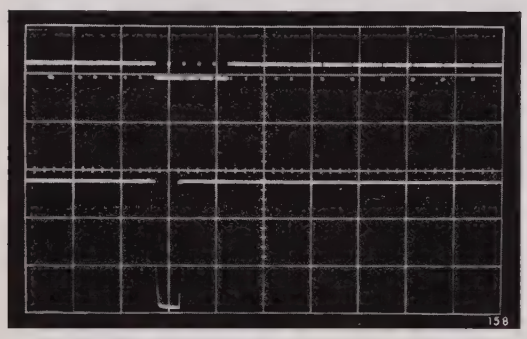
155. 0.5 V/cm 0,2 ms/cm
referenbe: "VIDEO I OUT"



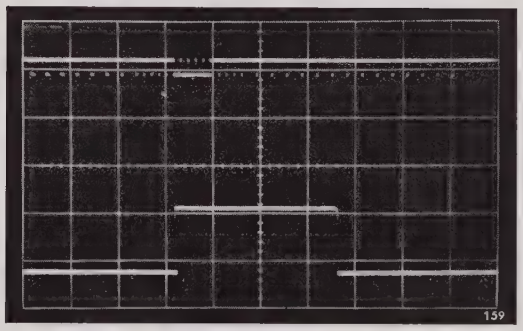
156. 2 V/cm 0.1 ms/cm
reference: "VIDEO I OUT"



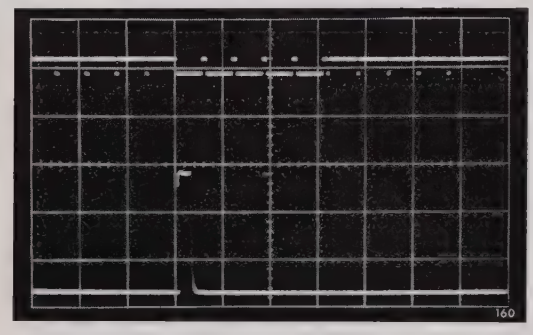
157. V /cm 50 µs/cm
reference: "VIDEO I OUT"



158. 2 V/cm 0.1 ms/cm
reference: "VIDEO I OUT"



159. 0.5 V/cm 0.2 ms/cm
reference: "VIDEO I OUT"



160. 2 V/cm 50 µs/cm
reference: "VIDEO I OUT"

Fig. XX-1 Oscillograms, unit 15

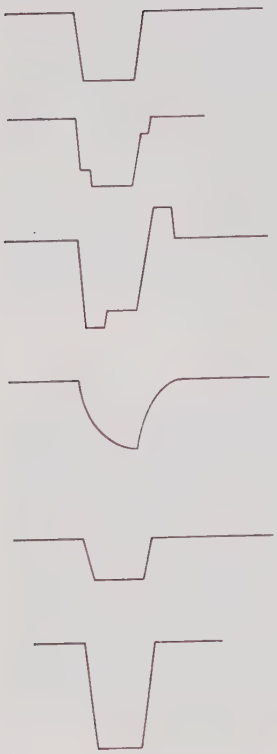


Fig. XX-2 Pulse diagram

Fig. XX-3 Pulse diagram

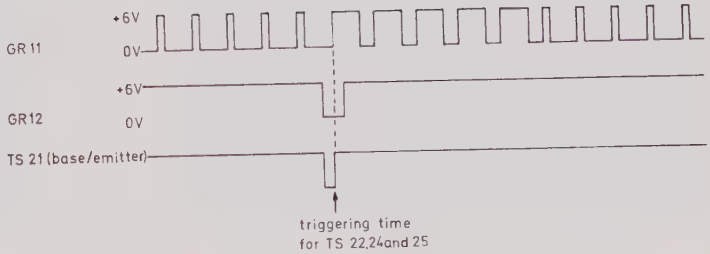


Fig. XX-5 Pulse diagram

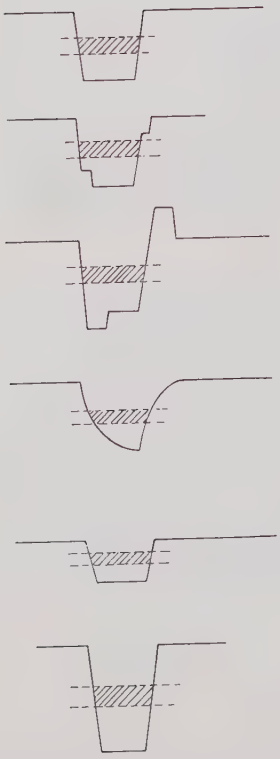


Fig. XX-4 Pulse diagram

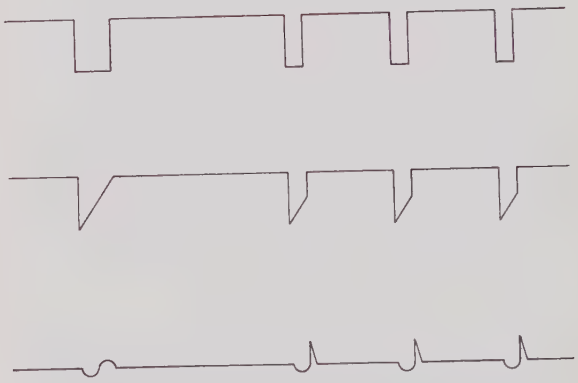


Fig. XX-6 Pulse diagram

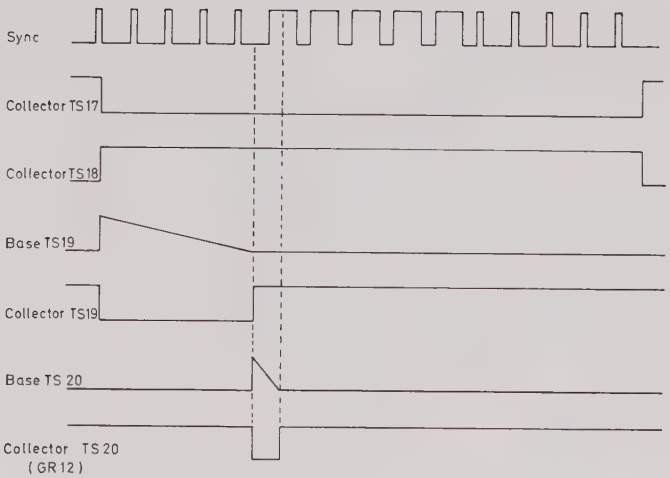


Fig. XX-7 Pulse diagram

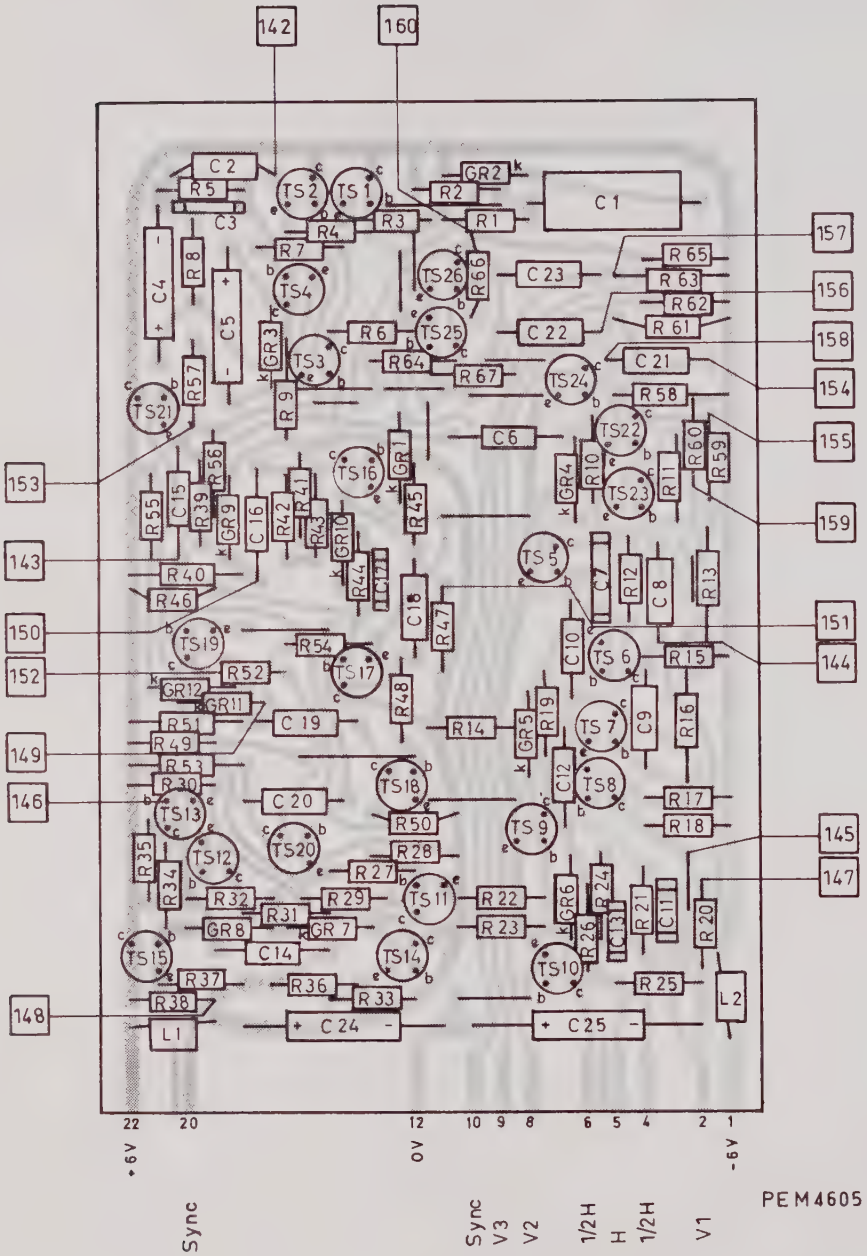


Fig. XX-8 Printed wiring board, input, unit 15

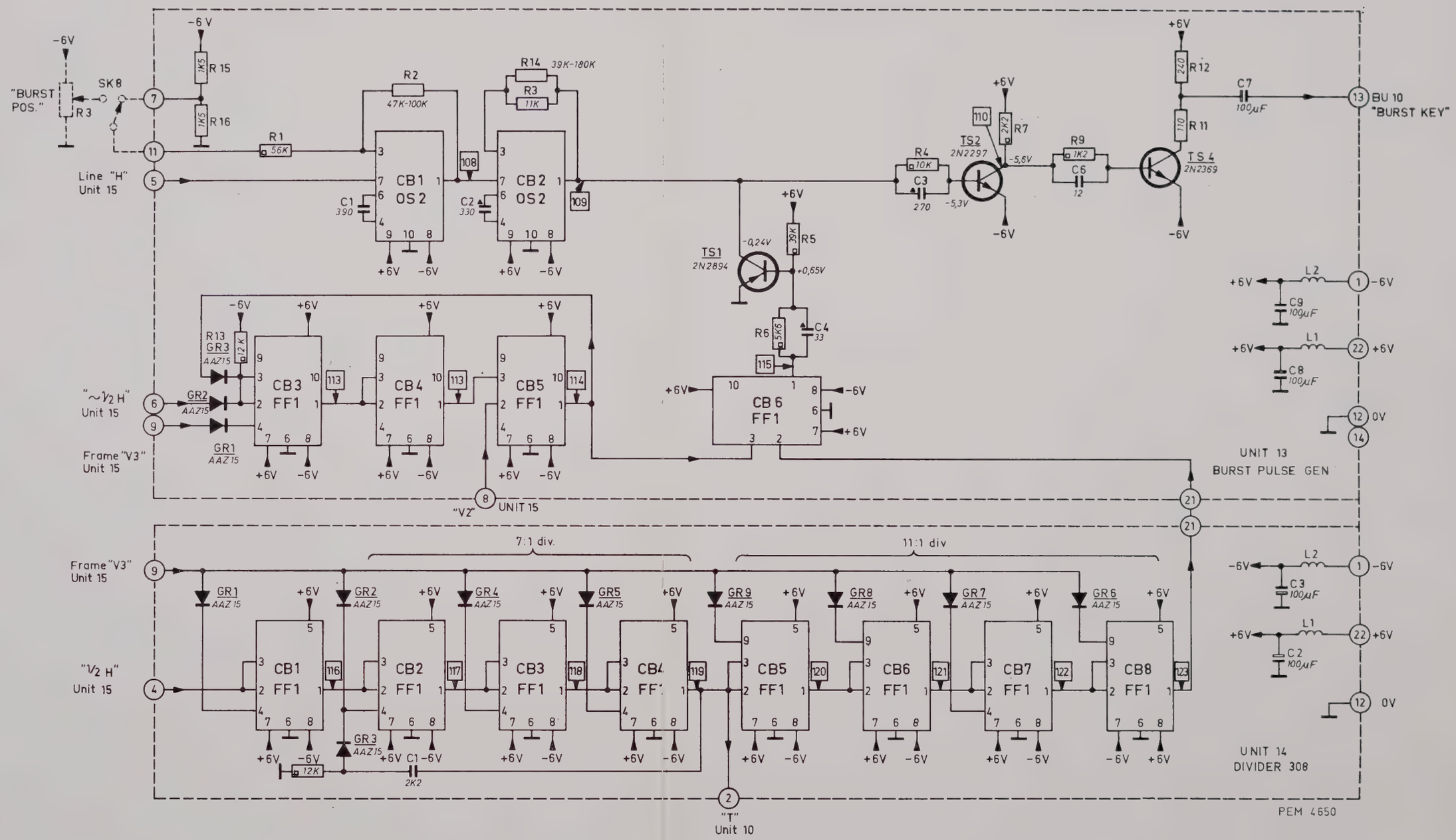


Fig. XIX-9 Circuit diagrams, burst pulse generator unit 13 and 308 : 1 divider, unit 14

XX Unit 15 - input

(see circuit diagram)

This unit contains circuits for:
- Composite sync. signal (with line- and frame pulse separators)
- $\frac{1}{2}$ f_H signal
- special frame pulses

The sync. signal delivered by the TV-pulse generator PHILIPS PM 5530 is quite accurately specified as regards pulse amplitude and pulse shape, but it may often be considerably distorted by the cable distribution network due to reflections, wrong terminations, cable losses, hum etc.

Fig. XX-2 and 3 show some examples of typical distortion. These disturbances on the pulses must all be suppressed to ensure a proper operation. Therefore the input circuit is provided with special circuits for eliminating the distortion.

Input circuit for composite sync. signal

The composite sync. signal is via terminal 10 applied to TS1–TS2. GR1 and GR2 limit the input signal to 12 V_{p-p} (symmetrical with respect to 0 V). The bias of TS1 is chosen so that only the centre part (the undistorted part, see fig. XX-4) of the pulse makes the transistor conducting. The pulse across the emitter resistor R3 will then appear with the correct shape. In order to eliminate hum from the signal a keyed clamping circuit is introduced. This is formed by TS4 operating on-off by means of sync. pulses which are applied to the base of TS3.
At each sync. pulse the base voltage to TS3 will be clamped via R8/C4 to a dc level which is automatically adjusted to half the pulse voltage.
In this way the reaction of possible hum in the signal is eliminated.
The complete sync. signal from TS3 is applied to the output circuit which consists of TS11...TS15.
TS14–TS15 is a push-pull coupled output stage where GR7–GR8 ensure the correct base voltage.

Line separator

TS5 and TS6 form a one-shot oscillator.
The positive going sync. pulse is differentiated by means of C6/R10 and the positive going front porch is via GR4 applied to TS5.
Without signal to the base of TS5 this transistor is in saturation (via R13).
The supplied positive pulses (via GR4) make TS5 cut-off and thus (via C7/R12) TS6 conducting.

This position, which is kept in a time determined by C8/R13, takes approx. 45 µsec.
The positive signal from TS6 is used for controlling the $\frac{1}{2}$ H generator (TS9 and TS10) and for controlling the one-shot circuit TS7, giving the line pulses.
Without signal on the base of TS7 this transistor is conducting, so that the voltage of the collector is 0 V.
The positive front porch of the signal from TS6, however, forces TS7 into cut-off. The cut-off time which is determined by C9/R16, is about 4,5 µsec.
The collector voltage is in this time —6 V. The negative pulse thus appearing is via inverter TS8 applied to terminal 5 as a positive line pulse (H).

$\frac{1}{2}$ H Generator

The $\frac{1}{2}$ H pulse is formed in a "flip-flop" divider. This circuit is controlled by means of the positive going H′ pulses from TS6.
This pulses, having a width of approx. 45 µsec. secure that the divider is not triggered by the pre-equalizing pulses.
The generated pulses are used for controlling the burst key generator.

Frame separator (see fig. XX-5, 6 and 7)

The frame pulses V1–V2 and V3 are generated in three identical one-shot circuits TS22–TS23, TS24 and TS25–TS26. (The working principle is identical to that of TS7 described under "line separator").

XXI Unit 16

Connection board

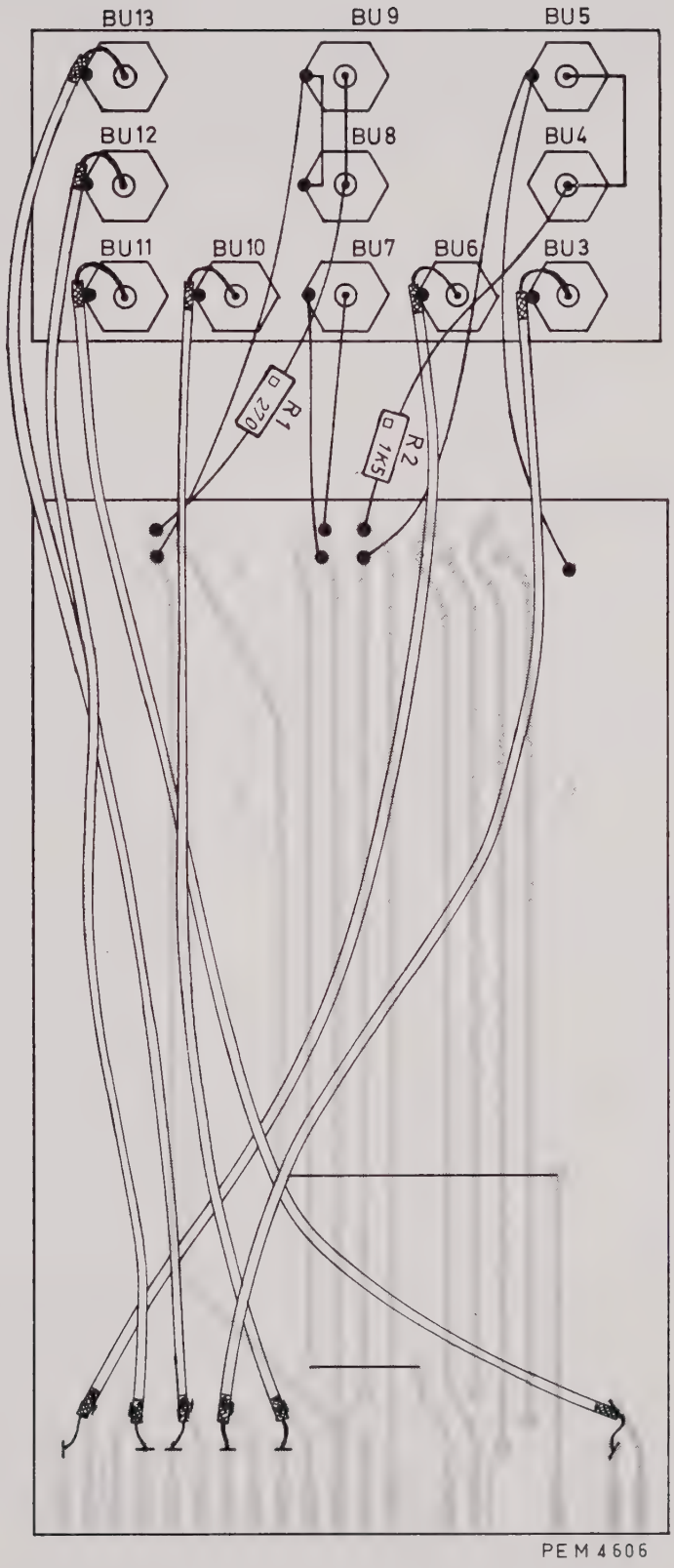


Fig. XXI Printed wiring board, connection board, unit 16

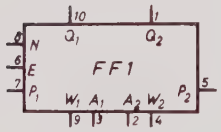
XXII General information on circuit blocks

Flip-Flop

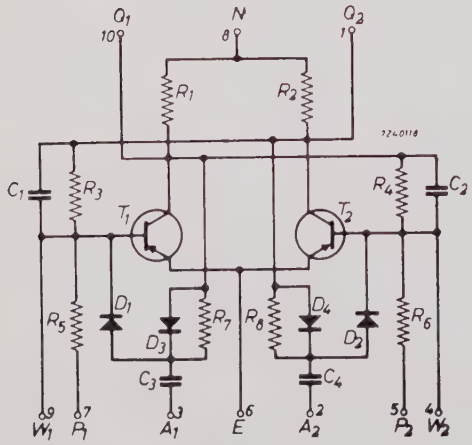
Type B8 920 00 – colour: red

Unit B8 920 00 contains a transistor bi-stable multivibrator circuit. The transistors are medium-speed switching types.

The circuit constitutes a memory function when driven by means of a DC level or a positive-going voltage step (AC input signal). It can also be used as a binary scale-of-two with a positive-going input signal.



Pulse repetition frequency range:	0-100 kHz
Ambient temperature range:	—20 to +60° C
Weight:	approx. 20 g



Circuit Data

Terminal

1 = Q_2 = output 2
2 = A_2 = AC input 2
3 = A_1 = AC input 1
4 = W_2 = DC input 2
5 = P_2 = supply +6 V (2)
6 = E = common supply 0 V
7 = P_1 = supply +6 V (1)
8 = N = supply —6 V
9 = W_1 = DC input 1
10 = Q_1 = output 1

Power Supply

Terminal

5 : V_{p2} = +6 V ± 10%, I_{p2}	= 0.15 mA[1]	Nominal value of the current
6 : V_e = 0 V common		
7 : V_{p1} = +6 V ± 10%, I_{p1}	= 0.15 mA[1]	
8 : V_n = —6 V ± 10%, $-I_n$ =	7 mA[1]	

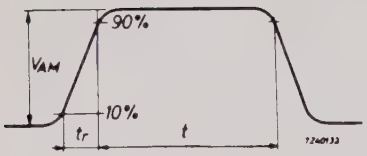
Input Data

Input Signal Requirements[2]

AC Input Signal (A terminals)

A positive-going voltage step is applied to terminal A_1 or A_2, or to both terminals interconnected in the case of binary scale-of-two applications. This voltage step drives the transistor T_1(T_2) into the non-conducting state.

[1] The sign is positive when the current flows towards the circuit. These data apply to the most adverse working condition for a combination of units, namely to supply voltages V_n = —5.4 V and V_q = +6.6 V. Unless differently specified all the voltage and current figures quoted represent absolute maximum values.



Voltage	V_{am}	= min. —0.66 V_n
		= max. —V_n
Rise time	t_r	= max. 0.4 µs
Length of driving pulse	t	= min. 0.5 µs
Input noise level		= max. 1 V peak to peak

DC Input Signals (W terminals)
A DC voltage level is applied to terminal W_1 or W_2. A positive voltage drives the transistor T_1 (T_2) into the non-conducting state and a negative voltage drives it into the conducting state.

Transistor conducting (output level "negative low")

Current	—I_w	= min 0.5 mA[1]
	(—V_w	= max. 0.35 V)
limiting value		max. 10 mA[1]

Transistor non-conducting (output level "negative high")

Voltage	V_w	= min. 0.2 V
limiting value		= max. 10 V
Current	I_w	= min. 1 mA[1]
	(I_w	= appr. 1.1 mA[1] at V_w = 6 V)

Input Impedance

Equivalent to a capacitance of approximately 500 pF (A_1, A_2 terminal or both terminals interconnected).

Output Data

Output Signal Characteristics[2]

Transistor conducting (output level "negative low")

Voltage	—V_q	= max. 0.2 V
Load current	—I_q	= max. 2.5 mA[1]

Transistor non-conducting (output level "negative high")

Voltage	—V_q	= min. —0.7 N_n
Load current	I_q	= max. 0.7 mA[1]

Load currents of equal sign, up to the values given as maxima can be drawn from the two output terminals simultaneously. In the case of simultaneous load currents of opposite sign, the maximum load currents given are not guaranteed.

Maximum Capacitive Load

(2000 pF for both Q-outputs together)
When the maximum capacitive and resistive loads are applied in parallel, the maximum pulse repetition frequency is not guaranteed.

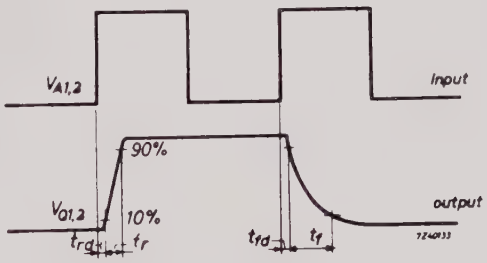
Output Impedance

Equivalent to a resistance of approx.

R_i	= 50 Ω for positive-going output voltage
R_i	= 1000 Ω for negative-going output voltage

Switching and Delay Times (for orientation only)

A square wave input signal (A terminals) is assumed with an amplitude of min. —0.7 V_n.



Unit unloaded

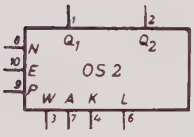
Rise delay	t_{rd}	= max. 0.8 µs
Rise time	t_r	= max. 0.3 µs
Fall delay	t_{fd}	= max. 0.6 µs
Fall time	t_f	= max. 2 µs

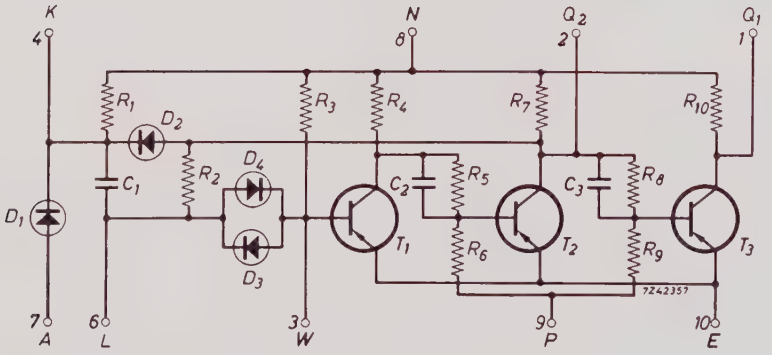
[1] The sign is positive when the current flows towards the circuit.

One-Shot Multivibrator

Type number	B8 950 03
Frequency range	0-100 kHz
Permissible ambient temperature	—20 to +60° C
Weight	approx. 20 g
Colour	green

Unit OS2 contains a monostable multivibrator circuit equipped with mediumspeed switching type transistors.





Circuit Data

Terminals

1 = Q_1 = output 1
2 = Q_2 = output 2
3 = W = d.c. input
4 = K = for external capacitor
5 = not connected
6 = L = for external capacitor
7 = A = trigger input
8 = N = supply (—6 V)
9 = P = supply (+6 V)
10 = E = common of supply (0 V)

Power supply

8 : V_n = —6 V ± 5%, $-I_n$ = 8.8 mA } nominal
9 : V_p = +6 V ± 5%, I_p = 0.4 mA } value
10 : V = 0 V common

Notes
The data given apply to the most adverse supply voltages for a combination of units, namely
V_n = —5.7 V and V_p = 6.3 V.

When a positive-going voltage step is applied to terminal A the circuit generates a pulse at the Q-terminals. The duration of the output pulse is determined by the value of:

a. The external capacitance parallel to C_1 between the terminals K and L (for pulses longer than the intrinsic value);

b. the external resistance between the terminals Q_1 and W (for pulses shorter than the intrinsic value).

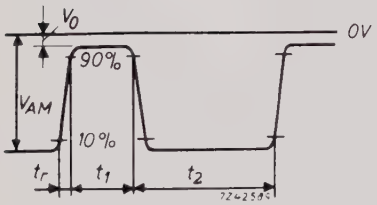
The temperatures —20°C and +60°C, and the tolerances on the supply voltages are absolute limiting values.
When a current is flowing towards the unit, the positive sign is used.

Input Requirements

Trigger input signal

(A terminal)
A positive-going voltage pulse is applied to terminal A. The leading edge of this voltage pulse drives by means of the transistor T_1 the transistor T_2 into the conducting and the transistor T_3 into the non-conducting state.

Voltage levels	V_{am}	= min.	$-0.7\ V_n$
		= max.	$-V_n$
	$-V°$	= min.	0 V
		= max.	0.2 V



Required current during the transient averaged over.			
0.4 µs	I_at	= min.	2.4 mA
0.7 µs		= min.	1.4 mA
Required direct current[1]	I_{ad}	= min.	1.3 mA
Rise time without external capacitor	t_r	= max.	0.4 µs
with a capacitor of min. 200 pF between terminals K and L	t_r	= max.	0.7 µs
Duration of driving pulse	t_1	= min.	1 µs
Recovery time when the duration of the output pulse (t_o) exceeds 7.5 µs	t^+	= min.	6 µs*
	t_2	= min.	$0.8\ t_o$*
Input noise level	V_n	= max.	1 V p–p

Output Data

Voltages and currents

Transistor conducting		Output Q_1	Output Q_2
Voltage	$-V_q$	= max. 0.2 V	max. 0.2 V
Available direct current	$-I_{qd}$	= max. 18 mA	max. 6 mA

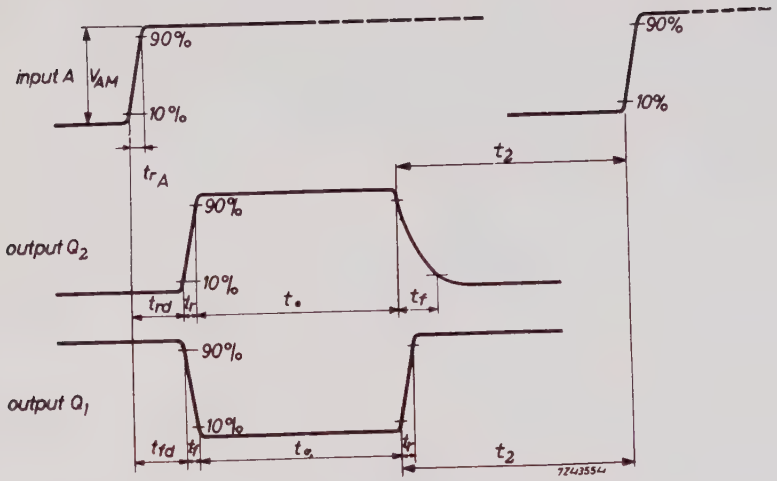
Available current during the transient averaged over:

0.4 µs	$-I_qt$	= max. 19 mA	max. 15 mA
0.7 µs		= max. 25 mA	max. 21 mA

Transistor non-conducting		Output Q_1	Output Q_2
Voltage	$-V_q$	= min. $-0.7\ V_n$	min. $-0.7\ V_n$
Available direct current	I_{qd}	= max. 0.7 VmA	min. —0.7 VmA

[1] This is the current flowing to the input of the OS2 during the input pulse after decay of the output pulse, if the duration of the input pulse is longer.

* The recovery time t_2 is starting at the trailing edge of V_a when $t_1 > t_o$ and the trailing edge of V_{q2} when $t_o > t_1$.



Switching and delay times

These data refer to an input signal as specified under "Input Data".

	Output Q_1	Output Q_2
Unit unloaded		
Rise delay t_{rd} =	— t_{ra}.	max. 0.4 µs
Rise time t_r =	max. 0.2 µs	max. 0.2 µs
Fall delay t_{fd} = t_{ra}.	max. 0.5 µs	—
Fall time t_f =	max. 0.4 µs	max. 3 µs

Duration of the output pulse

Unit unloaded

Instrinsic value t_o = max. 4 µs

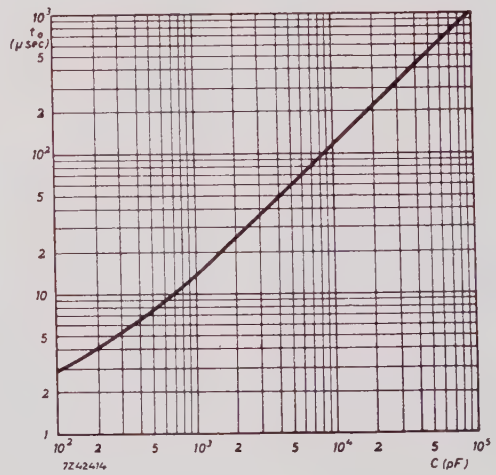
With resistor of 12 kΩ[2]) between terminals Q_1 and W t_o = max. 2 µs

With a capacitor between terminals K and L, at an ambient temperature of 25 °C and supply voltages V_n = —6 V and V_p = +6 V, see figure given below. For larger capacitances log t is proportionate to log C.

Stability of pulse duration

A variation of the supply voltage V_n of 5% varies the pulse duration by less than 1% in the same direction. The influence of a variation of the supply voltage V_p of 5% is negligible.

An increase in ambient temperature by 1 °C gives a reduction of the pulse duration of less than 0.5% and vice versa.



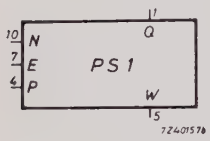
[2] minimum permissible value

Pulse Shaper

Type B895000 — Colour: green

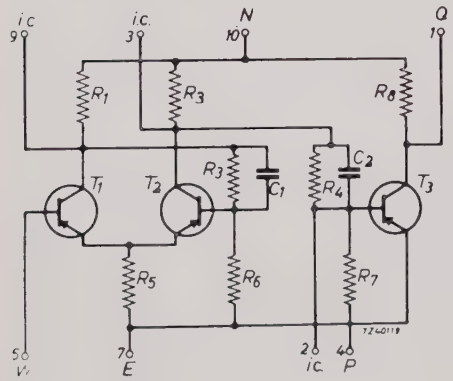
The unit B895000 contains a transistor squaring-amplifier followed by an inverter circuit. The transistors are medium-speed switching types.

A DC input signal of a magnitude exceeding the input tripping level of the unit, is re-shaped and inverted into the standard DC level at the output. The output voltage transients are very short and can be used for driving other circuit blocks, multivibrator circuits included.



Pulse repetition frequency range:	0–100 kHz
Ambient temperature range:	–20 to +60°C
Weight:	approx. 20 g

Circuit Data



Terminal
1 = Q = output
2 = internally connected
3 = internally connected
4 = P = supply +6 V
5 = W = input
6 = internally not connected
7 = E = common supply 0 V
8 = internally not connected
9 = internally connected
10 = N = supply —6 V

Power supply

Terminal

4: $V_p = +6\ V \pm 10\%$,	$I_p =$ 0.48mA[1]	Nominal value of the current
7: $V_e =$ 0 V common		
10: $V_n = -6\ V \pm 10\%$,	$-I_n =$ 3.3–6.2mA[1]	

Input Data

Input Signal Requirements[2]

A DC voltage level is applied to terminal W.

Transistor T_3 conducting (output level "negative low")

Voltage	$-V_w$ = min.	—0.4 V_n
Current	$-I_w$ = min.	0.1 mA[1]
limiting value	= max.	10 mA[1]

Transistor T_3 non-conducting (output level "negative high")

Voltage	$-V_w$ = max.	1 V
limiting value	V_w = max.	10 V
Current	I_w = min.	0.07 mA[1]

Hysteresis (difference between on and off tripping level)

Voltage	$\triangle V_w$ = min.	0.2 V

Input Impedance

Equivalent to a capacitance of approx. 330 pF

[1] The sign is positive when the current flows towards the circuit.

Output Data

Output Signal Characteristics[2]

Transistor T_3 conducting (output level "negative low")

Voltage	$-V_q$	= max. 0.2 V
Load current	$-I_q$	= max. 1.2 mA[1]

Transistor T_3 non-conducting (output level "negative high")

Voltage	$-V_q$	= min. —0.7 V_n
Load current	I_q	= max. 0.6 mA[1]

Output Impedance

Equivalent to a resistance of approx.

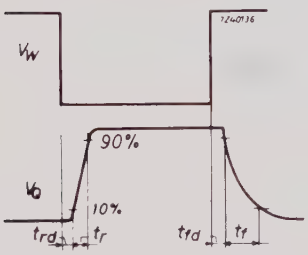
R_i = 100 Ω positive-going output voltage

R_i = 2200 Ω for negative-going output voltage

Switching Daley Times

(for orientation only)

A square wave input signal assumed with an amplitude of min. —0.7 V_n.



Unit unloaded

Rise delay	t_{rd}	= max. 0.1 µs
Rise time	t_r	= max. 0.2 µs
Fall delay	t_{fd}	= a function of driving current
Fall time	t_f	= max. 0.2 µs

[1] The sign is positive when the current flows towards the circuit.

[2] These data apply to the most adverse working conditions for a combination of units, namely to supply voltages V_p = —5.4 V and V_p = +6.6 V. Unless differently specified, all the voltage and current figures quoted represent absolute maximum values.

XXIII Access to and replacement of parts

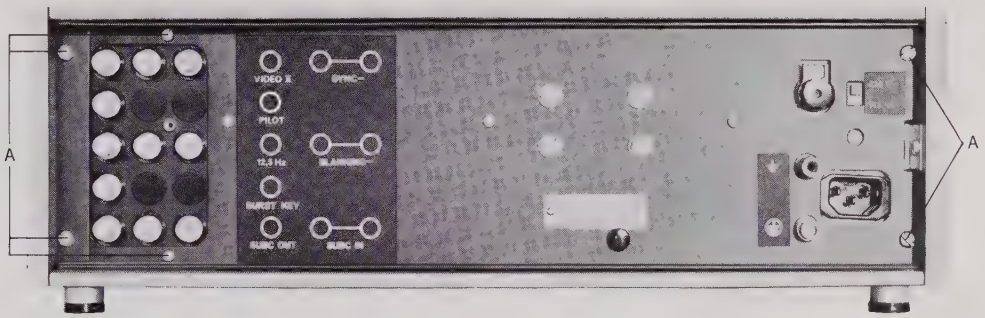


Fig. XXIII-1 Rear view

A. Removing the cabinet panels

The cabinet consists of a number of panels which can be removed separately.

1. Rear panel
   a. Loosen the 6 screws "A" (see Fig. XXIII-1)
   b. Remove the rear plate

2. Top panel
   a. Pull the springs at the rear corners of the panel, while lifting the rear of the panel,
   b. Push the panel forward and remove it.

3. Bottom panel
   a. Place the instrument upside down.
   b. Remove the 4 feet.
   c. Pull the springs, at the rear corners of the panel, while lifting the rear of the panel.
   d. Push the panel forward and remove it.

Fig. XXIII-2 Front view

B. Removing the front panel

a. Loosen the 4 screws "A" (see Fig. XXIII-2).
b. Pull the plate, placed on a slide, forward and turn it down.
The front panel components are then accessible.

XXIV Maintenance

A. Switches

Should the switches cease to function properly due to dirty contacts, they can be treated with switch oil (see list of mechanical parts).
This oil has both cleaning and lubricating properties. After using this oil, the switch should be operated a few times.

B. Cabinet panels

If the cabinet panels, covered with polyvinylchloride, become dirty, they can be washed with soap and water (first remove the panel from the casing, chapter XXIII). If necessary, fine scouring powder can be used.

XXV List of mechanical parts

Fig. XXV-1 Front view

Item	*Quantity*	*Description*	*Ordering number*
1	1	Text plate	4822 455 70085
2	1	Push-button unit	4822 276 60081
3	2	BNC connector	4822 267 10004
4	1	Lamp holder	4822 255 10025
5	1	Badge	4822 459 10086
6	1	Lamp holder	4822 255 10052

Item	Quantity	Description	Ordering number
7	11	BNC connector	4822 267 10004
8	1	Earth connector	4822 290 40011
9	1	Earth connector	4822 290 40012
10	1	Socket (mains conn.) (3-pole)	4822 265 30058
11	1	Switch	4822 277 20014
12	1	Fuse holder	4822 256 40012
	8	BNC connector (cable part)	4822 265 10003

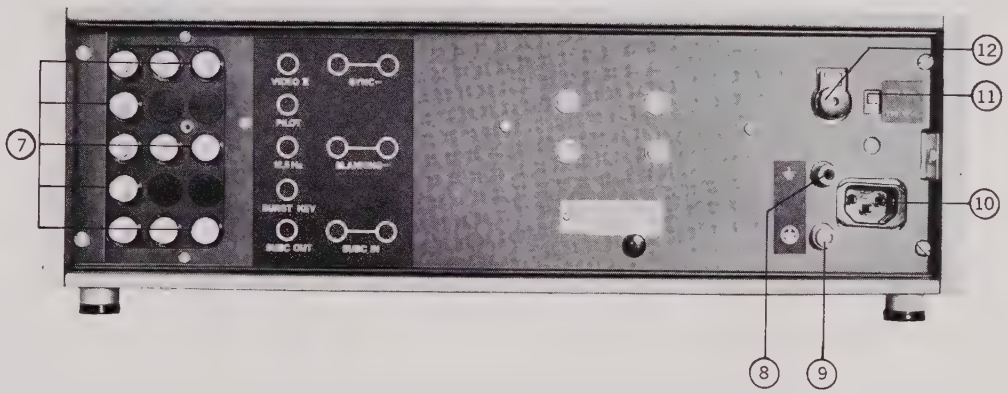


Fig. XXV-2 Rear view

Item	Quantity	Description	Ordering number
	1	Contact block	4822 267 70043
		Fuse for 115 V-operation	4822 253 30016
		Fuse for 230 V-operation	4822 253 30012
	5	75 Ω terminating plug	4822 264 10024
		Coxial cable (75 W)	4822 320 10028
	1	Mains cord	4822 321 10071
	1	Mains plug (female) (3-pole)	4822 266 20036
		10cc of switch oil	4822 390 10007

XXVI List of electrical parts

General

In this part list no multi-purpose and standard parts are stated. These components are indicated in the circuit diagram(s) by means of identification marks. Their specification can be derived from the survey below:

This parts list does not contain multi-purpose and standard parts. These components are indicated in the circuit diagram by means of identification marks. The specification can be derived from the survey below.

Diese Ersatzteilliste enthält keine Universal- und Standard-Teile. Diese sind im jeweiligen Prinzipschaltbild mit Kennzeichnungen versehen. Die Spezifikation kann aus nachstehender Übersicht abgeleitet werden.

In deze stuklijst zijn geen universele en standaardonderdelen opgenomen. Deze componenten zijn in het principeschema met een merkteken aangegeven. De specificatie van deze merktekens is hieronder vermeld.

La présente liste ne contient pas des pièces universelles et standard. Celles-ci ont été repérées dans le schéma de principe. Leurs specifications sont indiquées ci-dessous.

Esta lista de componentes no comprende componentes universales ni standard. Estos componentes están provistos en el esquema de principio de una marca. El significado de estas marcas se indica a continuación.

Carbon resistor E24 series
Kohleschichtwiderstand, Reihe E24
Koolweerstand E24 reeks
Résistance au carbone, série E24
Resistencia de carbón, serie E24
0,125 W 5%

Carbon resistor E12 series
Kohleschichtwiderstand, Reihe E12
Koolweerstand E12 reeks
Résistance au carbone, série E12
Resistencia de carbón, serie E12
0,25 W ≦ 1 MΩ, 5%
> 1 MΩ, 10%

Carbon resistor E24 series
Kohleschichtwiderstand, Reihe E24
Koolweerstand E24 reeks
Résistance au carbone, série E24
Resistencia de carbón, serie E24
0,5 W ≦ 5 MΩ, 1%
> 5 ≦ 10 MΩ, 2%
> 10 MΩ, 5%

Carbon resistor E12 series
Kohleschichtwiderstand, Reihe E12
Koolweerstand E12 reeks
Résistance au carbone, série E12
Resistencia de carbón, serie E12
0,5 W ≦ 1,5MΩ, 5%
> 1,5MΩ, 10%

Carbon resistor E12 series
Kohleschichtwiderstand, Reihe E12
Koolweerstand E12 reeks
Résistance au carbone, série E12
Resistencia de carbón, serie E12
1 W ≦ 2,2 MΩ, 5%
> 2,2 MΩ, 10%

Carbon resistor E12 series
Kohleschichtwiderstand, Reihe E12
Koolweerstand E12 reeks
Résistance au carbone, série E12
Resistencia de carbón, serie E12
2 W 5%

Wire-wound resistor
Drahtwiderstand
Draadgewonden weerstand
Résistance bobinée
Resistencia bobinada
0,4 – 1,8 W 0,5%

Wire-wound resistor
Drahtwiderstand
Draadgewonden weerstand
Résistance bobinée
Resistencia bobinada
5,5 W ≦ 200 Ω, 10%
> 200 Ω, 5%

Wire-wound resistor
Drahtwiderstand
Draadgewonden weerstand
Résistance bobinée
Resistencia bobinada
10 W 5%

Tubular ceramic capacitor
Rohrkondensator
Keramische kondensator, buistype
Condensateur céramique tubulaire
Condensador cerámico tubular
500 V

Tubular ceramic capacitor
Rohrkondensator
Keramische kondensator, buistype
Condensateur céramique tubulaire
Condensador cerámico tubular
700 V

Ceramic capacitor, "pin-up"
Keramikkondensator "Pin-up" (Perltyp)
Keramische kondensator "Pin-up" type
Condensateur céramique, type perle
Condensador cerámico, versión "colgable"
500 V

"Microplate" ceramic capacitor
Miniatur-Scheibenkondensator
"Microplate" keramische kondensator
Condensateur céramique "microplate"
Condensador cerámico "microplaca"
30 V

Mica capacitor
Glimmerkondensator
Micakondensator
Condensateur au mica
Condensador de mica
500 V

Polyester capacitor
Polyesterkondensator
Polyesterkondensator
Condensateur au polyester
Condensador polyester
400 V

Flat-foil polyester capacitor
Miniatur-Polyesterkondensator (flach)
Platte miniatuur polyesterkondensator
Condensateur au polyester, type plat
Condensador polyester, tipo de placas planas
250 V

Paper capacitor
Papierkondensator
Papierkondensator
Condensateur au papier
Condensador de papel
1000 V

Wire-wound trimmer
Drahttrimmer
Draadgewonden trimmer
Trimmer à fil
Trimmer bobinado

Tubular ceramic trimmer
Rohrtrimmer
Buisvormige keramische trimmer
Trimmer céramique tubulaire
Trimmer cerámico tubular

For multi-purpose and standard parts, please see PHILIPS' Service Catalogue.
Für die Universal- und Standard-Teile siehe den PHILIPS Service-Katalog.
Voor universele en standaardonderdelen raadplege men de PHILIPS Service Catalogus.
Pour les pièces universelles et standard veuillez consulter le Catalogue Service PHILIPS.
Para piezas universales y standard consulte el Catálogo de Servicio PHILIPS.

Print panels

Unit	*Quantity*	*Description*	*Print number*	*Ordering number*
1	1	Power supply	4008 108 70230	4822 212 80041
2	1	Extension board	4008 108 70670	4822 263 70013
3	1	Sub-carrier output	4008 108 71260	4822 212 80055
4	1	Sub-carrier osc.	4008 108 71270	4822 212 80056
6	1	Sub-carrier div.	4008 108 71290	4822 212 80057
7	1	Pilot osc.	4008 108 71300	4822 212 80058
8	1	25 Hz off-set	4008 108 71310	4822 212 80059
9	1	25 Hz-sine wave	4008 108 71320	4822 212 80061
10	1	Video output	4008 108 71330	4822 212 80062
11	1	Video generator	4008 108 71340	4822 212 80063
12	1	Horz.-line div.	4008 108 71350	4822 212 80064
13	1	Burst pulse generator	4008 108 71360	4822 212 80065
14	1	Divider 308 : 1	4008 108 71370	4822 212 80066
15	1	Input	4008 108 73570	4822 212 80082
16	1	Connection board	4008 108 73680	4822 273 70022

Diagram number	*Description*	*Value*	*Watt/volt*	*Ordering number*
R1	potentiometer	10 kΩ		4822 101 30072
R2	potentiometer	300 Ω		4822 101 30042
R3/SK8	potentiometer + switch	1 kΩ		4822 101 50027
LA1-LA2	signallamp		50 mA–6 V	4822 134 40003
Unit 1				
GR1-GR2	rectifier			4822 130 50185
C1-C2	electrolytic capacitor	2500 µF	25 V	4822 124 30009
C3	electrolytic capacitor	25 µF	40 V	4822 124 20047
C4-C5	electrolytic capacitor	200 µF	10 V	4822 124 20074
R4...R8	resistor	1.5 Ω	1 W	4822 116 60008
T1	transformer			4822 146 40139
Unit 3				
C1-C6	capacitor	10 kpF	250 V	4822 121 40029
C8	capacitor	10 kpF	250 V	4822 121 40029
C9	capacitor	0.15 µF	100 V	4822 121 40027
C11	capacitor	10 kpF	250 V	4822 121 40029
C12	capacitor	0.15 µF	100 V	4822 121 40027
C13	trimmer	0–60 pF		4822 125 50011
C15-C17	capacitor	10 kpF	250 V	4822 121 40029
C18	capacitor	0.15 µF	100 V	4822 121 40027
C20	capacitor	10 kpF	250 V	4822 121 40029
C21	capacitor	0.15 µF	100 V	4822 121 40027
C22	trimmer	0–60 pF		4822 125 50011
C24-C25	capacitor	10 kpF	250 V	4822 121 40029
C26-C27	electrolytic capacitor	10 µF	100 V	4822 124 10012
C28-C29	electrolytic capacitor	50 µF	10 V	4822 124 20054
R10	resistor	1 kΩ	0.125 W	4822 111 20018
R11-R12	resistor	330 Ω	0.125 W	4822 110 30094
R24	resistor	110 Ω	0.125 W	4822 110 30082
R27	resistor	110 Ω	0.125 W	4822 110 30082
R28	resistor	240 Ω	0.125 W	4822 110 30091
R33	resistor	110 Ω	0.125 W	4822 110 30082
R36	resistor	110 Ω	0.125 W	4822 110 30082
R37	resistor	240 Ω	0.125 W	4822 110 30091
R39-R40	resistor	68 kΩ	0.125 W	4822 110 20025
L3-L4	coil			4822 158 10038
Unit 4				
C1	capacitor	47 kpF	100 V	4822 121 40042
C2	capacitor	10 kpF	250 V	4822 121 40029
C4	trimmer	0–60 pF		4822 125 50011
C6–C7	capacitor	47 kpF	100 V	4822 121 40042
C8	capacitor	10 kpF	250 V	4822 121 40029
C10	trimmer	0–60 pF		4822 125 50011
C12-C13	capacitor	47 kpF	100 V	4822 121 40042
C14	capacitor	10 kpF	250 V	4822 121 40029
C16	trimmer	0–60 pF		4822 125 50011
C18	capacitor	47 kpF	100 V	4822 121 40042
C19-C20	electrolytic capacitor	100 µF	10 V	4822 124 20156

Diagram number	*Description*	*Value*	*Watt/volt*	*Ordering number*
L1-L2	coil			4822 158 10038
W1	crystal oven for X1			4822 259 90019
W2	crystal oven for X2 + X3			4822 259 90026
X1	crystal 4433618.75 Hz			4822 242 70121
X2	crystal 4433519 Hz			4822 242 70122
X3	crystal 4433719 Hz			4822 242 70123
Unit 6				
C2	electrolytic capacitor	16 µF	10 V	4822 124 20071
C3	capacitor	0.1 µF	100 V	4822 121 40036
C5	capacitor	270 pF	250 V	4822 121 50038
C6	capacitor	0.1 µF	100 V	4822 121 40036
C7	electrolytic capacitor	16 µF	10 V	4822 124 20071
C8	capacitor	0.1 µF	100 V	4822 121 40036
C9-C10	electrolytic capacitor	100 µF	10 V	4822 124 20156
R9	potentiometer	5 kΩ		4822 100 10036
R11	resistor	2.4 kΩ	1%	4822 110 30117
R12	resistor	1.1 kΩ	1%	4822 110 30108
R16	resistor	3 kΩ	1%	4822 110 30119
R17	resistor	5.6 kΩ	1%	4822 110 30127
R20	resistor	2.7 kΩ	1%	4822 110 30118
R21	resistor	1.6 kΩ	1%	4822 110 30113
L1-L2	coil			4822 158 10038
L3	coil			4822 157 30108
T1	transformer			4822 158 40043
Unit 7				
C1	capacitor	10 kpF	250 V	4822 121 40029
C5-C6-C7	capacitor	10 kpF	250 V	4822 121 40029
C8	capacitor	68 kpF	100 V	4822 121 40094
C9-C10	capacitor	0.1 µF	100 V	4822 121 40036
C11	electrolytic capacitor	16 µF	10 V	4822 124 20071
C12-C13	electrolytic capacitor	100 µF	10 V	4822 124 20156
R21	resistor	110 Ω	0.125 W	4822 110 30082
R22	resistor	240 Ω	0.125 W	4822 110 30091
R23	resistor	110 Ω	0.125 W	4822 110 30082
L1-L2	coil			4822 158 10038
X1	crystal 125000 Hz			4822 242 70124
Unit 8				
C1	capacitor	82 pF	250 V	4822 120 60078
C2	capacitor	47 pF	250 V	4822 120 60072
C3-C4	capacitor	10 kpF	63 V	4822 121 50097
C5-C6	capacitor	100 pF	250 V	4822 120 60081
C7-C8-C9	capacitor	10 kpF	63 V	4822 121 50097
C10	capacitor	68 pF	250 V	4822 120 60076
C11	trimmer	0–60 pF		4822 125 50011
C12	capacitor	100 pF	250 V	4822 120 60081
C13-C16	capacitor	10 kpF	63 V	4822 121 50097
C17	trimmer	0–60 pF		4822 125 50011

Diagram number	Description	Value	Watt/volt	Ordering number
C18	capacitor	10 kpF	63 V	4822 121 50097
C19	capacitor	0.1 µF	100 V	4822 121 40036
C20	trimmer	0–60 pF		4822 125 50011
C21-C22	electrolytic capacitor	100 µF	10 V	4822 124 20156
C23-C26	capacitor	10 kpF	250 V	4822 121 40029
R6	resistor	330 Ω	0.125 W	4822 110 30094
R8-R11	resistor	1.2 kΩ	0.125 W	4822 110 30109
R12	resistor	330 Ω	0.125 W	4822 110 30094
R14-R17	resistor	1.2 kΩ	0.125 W	4822 110 30109
L1-L2	coil			4822 157 50557
L3-L6	coil			4822 158 10038
L7	coil			4822 157 50557
L8	coil			4822 157 30108
L9	coil			4822 157 50557
L10-L13	coil			4822 158 10038
T1-T4	transformer			4822 158 10214
Unit 9				
C1	electrolytic capacitor	80 µF	4 V	4822 124 20084
C2-C4	capacitor	0.68 µF	100 V	4822 121 40077
C5	electrolytic capacitor	16 µF	10 V	4822 124 20071
C6	capacitor	0.68 µF	100 V	4822 121 40077
C7	capacitor	82 kpF	63 V	4822 121 50281
C8-C9	electrolytic capacitor	160 µF	4 V	4822 124 20013
C10-C11	electrolytic capacitor	100 µF	10 V	4822 124 20156
R3	resistor	15 kΩ	0.125 W	4822 110 30138
R6-R7	resistor	15 kΩ	0.125 W	4822 110 30138
R10	resistor	15 kΩ	0.125 W	4822 110 30138
R12	resistor	1.5 kΩ	0.125 W	4822 110 30112
R13	resistor	3.9 kΩ	0.125 W	4822 110 30123
R14	resistor	75 kΩ	0.125 W	4822 110 30157
R15	resistor	1.5 kΩ	0.125 W	4822 110 30112
R18	resistor	470 Ω	0.125 W	4822 110 30098
R19	resistor	1.2 kΩ	0.125 W	4822 110 30109
R20	potentiometer	2 kΩ		4822 100 10029
R22	potentiometer	200 Ω		4822 100 10059
R23	resistor	470 Ω	0.125 W	4822 110 30098
R24	resistor	1.2 kΩ	0.125 W	4822 110 30109
R27	resistor	470 Ω	0.125 W	4822 110 30098
R28	resistor	1.2 kΩ	0.125 W	4822 110 30109
R29	potentiometer	2 kΩ		4822 100 10029
R31	potentiometer	200 Ω		4822 100 10059
R33	resistor	1.2 kΩ		4822 110 30109
L1-L2	coil			4822 158 10038
Unit 10				
C1	electrolytic capacitor	10 µF	10 V	4822 124 20077
C2	capacitor	0.1 µF	100 V	4822 121 40036
C4-C5	electrolytic capacitor	10 µF	10 V	4822 124 20077

Diagram number	*Description*	*Value*	*Watt/volt*	*Ordering number*
C7-C8	electrolytic capacitor	640 µF	6.4 V	4822 124 20019
C9-C10	electrolytic capacitor	100 µF	10 V	4822 124 20156
C11	capacitor	0.47 µF	100 V	4822 121 40015
C12	capacitor	0.15 µF	100 V	4822 121 40035
C13	electrolytic capacitor	400 µF	10 V	4822 124 20074
R11	resistor	20 kΩ	0.125 W	4822 110 30142
R13	resistor	1.5 kΩ	0.125 W	4822 110 30112
R15	resistor	4.3 kΩ	0.125 W	4822 110 30124
R17	resistor	1 kΩ	0.125 W	4822 110 30107
R18	resistor	1.3 kΩ	0.125 W	4822 110 30111
R22	resistor	75 Ω	0.125 W	4822 110 30077
R26	resistor	75 Ω	0.125 W	4822 110 30077
R47	resistor	110 Ω	0.125 W	4822 110 30082
R48	resistor	240 Ω	0.125 W	4822 110 30091
L1-L2	coil			4822 158 10038
Unit 11				
C1	capacitor	680 pF	250 V	4822 120 60103
C2	capacitor	820 pF	500 V	4822 120 60105
C3	capacitor	0.56 µF	100 V	4822 121 40044
C11-C12	electrolytic capacitor	100 µF	10 V	4822 124 20156
C24	capacitor	68 pF	100 V	4822 120 60076
C25	capacitor	0.33 µF	100 V	4822 121 40009
C26	capacitor	10 kpF	250 V	4822 121 40029
C27	electrolytic capacitor	16 µF	10 V	4822 124 20071
R3	resistor	5.6 kΩ	0.125 W	4822 110 30127
R5	resistor	5.1 kΩ	0.125 W	4822 110 30126
R6	resistor	5.6 kΩ	0.125 W	4822 110 30127
R7	resistor	1.8 kΩ	0.125 W	4822 110 30114
R9	resistor	12 kΩ	0.125 W	4822 110 30136
R10	resistor	1.5 kΩ	0.125 W	4822 110 30112
L1-L3	coil			4822 158 10038
Unit 12				
C1	capacitor	47 kpF	100 V	4822 121 40042
C2	capacitor	22 kpF	250 V	4822 121 40091
C4	capacitor	2.2 kpF	125 V	4822 120 10116
C5-C6	electrolytic capacitor	100 µF	10 V	4822 124 20156
C7	capacitor	0.1 µF	100 V	4822 121 40036
L1-L2	coil			4822 158 10038
Unit 13				
C1	capacitor	300 pF	250 V	4822 120 60096
C5	capacitor	1000 pF	500 V	4822 120 60107
C6	capacitor	12 pF	250 V	4822 120 10056
C7	electrolytic capacitor	100 µF	10 V	4822 124 20156
C8-C9	electrolytic capacitor	100 µF	10 V	4822 124 20156
R3	resistor	11 kΩ	0.125 W	4822 116 50009
R10-11	resistor	110 Ω	0.125 W	4822 110 30082
R12	resistor	240 Ω	0.125 W	4822 110 30091
R15-R16	resistor	1.5 kΩ	0.125 W	4822 110 30112
L1-L2	coil			4822 158 10038

Diagram number	Description	Value	Watt/volt	Ordering number
Unit 14				
C1	capacitor	2.2 kpF	125 V	4822 120 10116
C2-C3	electrolytic capacitor	100 µF	10 V	4822 124 20156
L1-L2	coil			4822 158 10038
Unit 15				
C1	capacitor	1 µF	100 V	4822 121 40176
C2	capacitor	0.1 µF	100 V	4822 121 40036
C4-C5	electrolytic capacitor	10 µF	16 V	4822 124 20353
C6-C10, C12-C14	capacitor	100 pF	160 V	4822 121 50411
C8	capacitor	3.3 kpF	125 V	4822 121 50235
C9	capacitor	1 kpF	500 V	4822 121 50186
C15	capacitor	150 pF	160 V	4822 121 50021
C16	capacitor	47 pF	160 V	4822 120 30372
C18	capacitor	15 kpF	250 V	4822 121 40089
C19	capacitor	10 kpF	63 V	4822 121 50097
C20	capacitor	6.8 kpF	63 V	4822 121 50234
C21	capacitor	12 kpF	63 V	4822 121 50342
C22-C23	capacitor	4.7 kpF	63 V	4822 121 50094
C24-C25	electrolytic capacitor	100 µF	10 V	4822 124 20384
R13-R61	resistor	18 kΩ	0.125 W	4822 116 50192
R16	resistor	6.8 kΩ	0.125 W	4822 116 50104
R40	resistor	68 kΩ	0.125 W	4822 111 20025
R51	resistor	39 kΩ	0.125 W	4822 116 50106
R53	resistor	10 kΩ	0.125 W	4822 116 50463
R58	resistor	100 kΩ	0.125 W	4822 111 20034
R63	resistor	13 kΩ	0.125 W	4822 111 20036
L1-L2	coil			4822 158 10052

Semiconductors

Type	Ordering number	Type	Ordering number
ASY 27	4822 130 40269	AAY21	4822 130 30087
ASZ16	4822 130 40279	AAZ15	4822 130 30229
2N930	4822 130 40051	BAX16	4822 130 30273
2N2297	4822 130 40131	BAY38	4822 130 40256
2N2369	4822 130 40407	BZY56	4822 130 30129
2N2894	4822 130 40018	BZY61	4822 130 30244
2N2905	4822 130 40021	OA202	4822 130 30239

XXVII Sales and service all over the world

Addresses

If the instrument has to be sent to a PHILIPS Service Centre, the following points should be noted:
Carefully pack the instrument in a sealed plastic bag and then in the original packing or (if this no longer available) pack the instrument in a box; attach a label stating the address of the sender and describing the fault(s) as fully as possible;
Send the instrument to the address decided on after consultation with the PHILIPS representative in your country: state reference number(s), if any.

Algérie: S.A. Philips Nord-Africaine, Route de la Femme Sauvage, Alger; tel. 647 200/1/2

Argentina: Philips Argentina S.A., Casilla Correo 3479, Buenos Aires; tel. T.E. 70, 7741 al 7749

Australia: Philips Electrical (Pty) Ltd., P.O.B. 2703 G.P.O., 69-79 Clarence Street, Sydney; tel. 20-223

België/Belgique: M.B.L.E., 80 Rue des Deux Gares, Bruxelles; tel. 23 00 00

Bolivia: Philips Sudamericana, Casilla 1609, La Paz; tel. 5270-5664

Brasil: Messrs. Inbelsa, Rua Amador Bueno 474, Caixa Postal 3159; Sao Paulo; tel. 93-9191

Burundi: Philips S.A.R.L., Avenue de Grèce, B.P. 900, Bujumbura

Canada: Philips Electronic Industries, Electronic Equipment Division, 116 Vanderhoof Avenue, Toronto 17, Ontario; tel. 425-5161

Chile: Philips Chiléna S.A., Casilla 2687, Santiago de Chile; tel. 35081

Colombia: Philips Colombiana S.A., Communications Department, Apartado Nacional 1505, Bogotá; tel. 473-640

Congo: Philips S.A.R.L., 620, Avenue Industrielle, B.P. 2546, Lubumbashi; Philips Congo S.C.R.L., 137, Boulevard du 30 Juin, B.P. 1798, Kinshasa; 52, Avenue des Eucalyptus, B.P. 2020, Stanleyville

Costa Rica: Philips de Costa Rica Ltd., Apartado Postal 4325, San José; tel. 5670

Curaçao: Philips Antillana N.V., Postbus 523, Willemstad; tel. Curaçao 36222-35464

Danmark: Philips A.S., Prags Boulevard 80, København; tel. Asta 2222

Deutschland (Bundesrepublik): Philips Industrie Elektronik GmbH., Röntgenstrasse 22, Postfach 111, 2 Hamburg 63; tel. 501031

Ecuador: Philips Ecuador S.A., Casilla 343, Quito; tel. 30064

Egypt: Resident delegate office, P.O.B. 1687, 43 Kasr El Nil Street, Cairo; tel. 74933

El Salvador: Philips de El Salvador, Apartado Postal 865, San Salvador; tel. 7441

España: Philips Ibérica S.A.E., Avenida de America, Madrid; tel. 228 20 00

Ethiopia: Philips Ethiopia (Priv. Ltd., Co.), P.O.B. 659, Cunningham Street, Addis Abeba; tel. 13440

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Ghana: Philips (Ghana) Ltd., P.O.B. M 14, Accra

Great Britain: M.E.L., Equipment Company Ltd., Manor Royal, Crawley (Sussex); tel. 28787

Guatemala: Philips de Guatemala S.A., Apartado Postal 238, Guatemala City; tel. 20607-08-09

Hellas: Philips S.A. Hellénique, B.P. 153, Athènes; tel. 230476

Hong Kong: Philips Hong Kong Ltd., P.O.B. 2108, Rooms 1006/1008 Prince's Building, Hong Kong; tel. 33728, 28548

India: Philips India Ltd., PIT/S.E. Dept., Dr. Annie Besant Road, P.O.B. 6598, Worli, Bombay 18; tel. 245144

Iran: Philips Iran Ltd., P.O.B. 1297, Teheran; tel. 48344-68344

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Ireland: Philips Electrical (Ireland) Ltd., Newstead, Clonskeagh, Dublin 14; tel. 976611

Island: Mr. Snorri P.B. Arnar, P.O.B. 354, Reykjavik; tel. 13869

Islands Canarias: Philips Ibérica S.A.E., Triana 132, Las Palmas 39-41 Santa Cruz de Tenerife

Israël: Isralectra Ltd., 12, Allenby Road, P.O.B. 1608, Haifa; tel. 526231

Italia: Philips S.p.A., Casella Postale 3992, Milano; tel. 69.94

Liban: Philips Liban S.A., P.O.B. 670, Beyrouth; tel. 232303-232458/59

Malaya: Philips Singapore Ltd., P.O.B. 1358 N.T.S. Building, d'Almeida Street, Singapore; tel. 94914

Maroc: Société Anonyme Marocaine de Télécommunications, Place Lemaigre Dubreuil, Casablanca; tel. 439-92

Mexico: Philips S.E.T., Apartado Postal 24420, Mexico 7 D.F.; tel. 25-15-40

Nederland: Philips Bedrijfsapparatuur Nederland N.V., Boschdijk VB, Eindhoven; tel. 3-33-33

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New Zealand: Electronic Development and Applications Co. Ltd., 18-20 Lorne Street, P.O.B. 2097, Wellington; tel. 54-039

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Norge: Norsk A.S. Philips, Postboks 5040, Oslo; tel. 463890

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Pakistan: Philips Electrical Co. of Pakistan Ltd., Bunder Road, P.O.B. 7101, Karachi; tel. 70071

Paraguay: Philips del Paraguay S.A., Casilla de Correo 605, Asunción; tel. 8045-5536-6666

Perú: Philips Peruana S.A., Apartado Postal 1841, Lima; tel. 34620-40265

Philippines: Electronic Development & Application Center, Room 715, Don Santiago Bld., 1344 Taft Avenue, Manila

Portugal: Philips Portuguesa S.A.R.L., Rua Joaquim Antonio d'Aquiar 66, Lisboa; tel. 683121/9

Rhodesia: Philips Rhodesian (Private) Ltd., P.O.B. 994, Gordon Avenue, Salisbury; tel. 29081

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Türkiye: Türk Philips Ticaret A.S., Posta Kutusu 504, Istanbul; tel. 447486

Uruguay: Philips de Uruguay, Avda Uruguay 1287, Montevideo; tel. 956 41-2-3-4

U.S.A.: Philips Electronic Instruments, 750 South Fulton Ave., Mount Vernon, N.Y. 10550-(914) 664-4500

Venezuela: C.A. Philips Venezolana, Apartado Postal 1167, Caracas; tel. 72 01 51

Zambia: Philips Electrical Ltd., Freetown Road, P.O.B. 553, Kitwe; Philips Electrical Ltd., P.O.B. 1878 Lusaka

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